1. A 7-year-old boy is brought to the office by his mother because of a 1-month history of urinary incontinence. During this time, he also has passed occasional hard, painful stools. He has not had pain with urination or changes in appetite. He has had occasional episodes of daytime enuresis at school since he was toilet trained at the age of 4 years; until last month, these episodes were rare. He has wet the bed four times weekly during the past month. His mother cannot identify any new stressors at home. He has no history of serious illness and receives no medications. Vaccinations are up-to-date. He receives grades of A's in school. He is at the 25th percentile for height and weight and 35th percentile for BMI. Vital signs are within normal limits. Examination shows no abnormalities. Urinalysis shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Administration of an osmotic laxative
B) Desmopressin therapy
C) Recommendation for use of a bed-wetting alarm
D) Renal ultrasonography
E) Reassurance that this is normal behavior

Correct Answer: A.

Constipation leads to the formation of hard stools that can accumulate over time and apply pressure to the bladder, leading to urinary incontinence. Symptoms include daytime enuresis, bedwetting, urinary frequency and urgency, or urinary tract infection. A history of constipation and the passage of hard, painful stools is suggestive of this. Pediatric constipation is a common problem and is usually functional, although other causes such as congenital megacolon (Hirschsprung disease), spina bifida, hypothyroidism, cystic fibrosis, or diabetes insipidus should be excluded by a careful history and physical examination. Major signs that suggest an organic cause of constipation include onset of constipation prior to 1 month of age, delayed passage of meconium, failure to thrive, abdominal distension, intermittent diarrhea or explosive stools, an empty rectal vault or tight anal sphincter, and midline hair or pigmentary changes over the lumbar spine. Imaging and extensive laboratory testing are usually not necessary for most children. Treatment of constipation includes osmotic or polyethylene glycol-based laxatives and dietary modification with increased intake of fluids and fiber.

Incorrect Answers: B, C, D, and E.

Desmopressin therapy (Choice B), a vasopressin analogue, is useful for the treatment of constipation secondary to diabetes insipidus. Diabetes insipidus presents with large volumes of dilute urine, dehydration, thirst, and increased serum osmolality.

Recommendation for use of a bed-wetting alarm (Choice C) is a useful treatment for nocturnal enuresis, but is not helpful for the treatment of urinary incontinence secondary to constipation. This patient's history of passage of hard, painful stools suggests that constipation is the primary cause of his urinary incontinence.

Renal ultrasonography (Choice D) is useful for the evaluation of hydronephrosis, vesicoureteral reflux, and congenital urinary tract abnormalities.

Reassurance that this is normal behavior (Choice E) is incorrect and will delay the treatment of this child's constipation.

Educational Objective: Constipation is a common pediatric problem and may lead to urinary incontinence as a result of external compression of the bladder. Constipation is usually a functional problem, but familiarity with red flag signs is crucial to excluding organic causes. Treatment of constipation includes osmotic or polyethylene glycol-based laxatives and dietary modification with increased intake of fluids and fiber.

2. A 14-year-old boy is brought to the physician by his mother because she has had difficulty awakening him in the morning since the start of the school year 3 months ago. She reports that last year he would always get up on his own. She now has to rouse him several times every morning. She says that he has the same group of friends as he did last year. When interviewed alone, the patient says that during the summer he discovered a talk show at 10 PM that he enjoys watching. He states that he is not tired at 10 PM, which was his bedtime last year. Physical examination shows no abnormalities. Which of the following is the most appropriate next step?

A) Urine toxicology screening
B) Use of an over-the-counter sleeping medication as needed
C) Modafinil use in the morning
D) Zolpidem use at bedtime
E) No further treatment is indicated

Correct Answer: E.

This patient is demonstrating sleep patterns and behaviors that are typical for adolescents. After puberty, adolescents' circadian rhythm is delayed approximately 2 hours compared to before puberty. This circadian rhythm change combined with the increasing prevalence of evening light exposure (eg, screen time at night) commonly leads to a delayed bedtime in typical adolescents. The physician should encourage sleep hygiene (eg, advise the patient to avoid screen time before bedtime), though no pharmacotherapy is indicated.

Incorrect Answers: A, B, C, and D.

Urine toxicology screening (Choice A) could assist in diagnosing substance use as a cause of insomnia. However, this patient's sleep pattern is normal and not consistent with insomnia.

Over-the-counter medication such as antihistamines (Choice B) or zolpidem (Choice D) can be utilized for primary insomnia. However, this patient's sleep pattern is normal and not consistent with insomnia.

Modafinil therapy (Choice C) is a central nervous system stimulant commonly utilized to address daytime sleepiness in patients with narcolepsy, obstructive sleep apnea, and shift-work sleep disorder. Though this patient has difficulty waking up, he does not experience daytime sleepiness.

Educational Objective: After puberty, adolescents' circadian rhythms are delayed by approximately 2 hours. No pharmacotherapy is indicated for this normal change.

3. An asymptomatic 37-year-old woman comes to the physician for a follow-up examination after an HIV antibody test was positive. Her last HIV antibody test 5 years ago was negative. She has no previous history of sexually transmitted disease. During the past 10 years, she has been sexually active with eight male partners; she uses an oral contraceptive. She does not know of any partners who are HIV positive. She exercises regularly. Her vital signs are within normal limits. Examination shows no abnormalities. A complete blood count and serum electrolyte, urea nitrogen, and creatinine concentrations are within the reference range. Her CD4+ T-lymphocyte count is 410/mm^3 (Normal≥500), and plasma HIV viral load is 30,000 copies/mL. Urine pregnancy test is negative. Serologic testing for hepatitis and a PPD skin test are negative. Liver function tests show no abnormalities. Antiretroviral therapy is begun. Which of the following is the most appropriate next step to prevent infections in this patient?

A) Fluconazole therapy

B) Isoniazid therapy

C) Pyrimethamine and sulfamethoxazole therapy

D) Trimethoprim-sulfamethoxazole therapy

E) 23-Valent pneumococcal vaccine

Correct Answer: E.

23-Valent pneumococcal, or pneumococcal 23-valent polysaccharide vaccination (PPSV23) is the most appropriate next step to prevent infectious complications in this patient with newly diagnosed HIV infection. There are two pneumococcal vaccines that are routinely given to patients with certain health conditions or at particular ages: PPSV23 and the pneumococcal 13-valent conjugate vaccine (PCV13). PPSV23 is indicated for all patients over the age of 65 regardless of underlying medical conditions but is also given to patients between age 19 and 64 with certain medical conditions. PCV13 is typically only given to patients with certain underlying medical conditions, including patients with HIV infection, lymphoma, leukemia or multiple myeloma, functional or anatomic asplenia, end-stage kidney disease, cochlear implants, cerebrospinal fluid leaks, a history of solid organ transplant, and congenital or acquired immunodeficiencies, among several other conditions. In this patient, the PCV13 vaccine should be given first followed by the PPSV23 vaccine at least 8 weeks later. Revaccination with PPSV23 should occur again 5 years after the first dose.

Incorrect Answers: A, B, C, and D.

Fluconazole therapy (Choice A) is indicated to treat candida infections in patients with HIV, although these infections rarely occur in patients with CD4+ counts above 100 cells/mm^3. This patient has no evidence of candida infection and does not require treatment or prophylaxis.

Isoniazid therapy (Choice B) is used to treat latent *Mycobacterium tuberculosis* infection (latent) after ruling out active tuberculosis (which requires combination therapy). This patient has a negative PPD skin test in the setting of a relatively normal CD4 count, which effectively rules out latent tuberculosis infection.

Pyrimethamine and sulfamethoxazole therapy (Choice C) is not indicated in this patient. Either pyrimethamine with sulfadiazine or trimethoprim-sulfamethoxazole (Choice D) can be used to treat or prevent toxoplasmosis infection, but the combination of pyrimethamine and sulfamethoxazole is not typically used. Prophylaxis is indicated once the CD4+ T-cell count falls below 200 cells/mm ^{3}.

Educational Objective: Patients with HIV infection and other immunocompromising conditions should receive both pneumococcal vaccines. The Center for Disease Control recommends administering PCV13 first in patients with HIV followed by PPSV23 at least 8 weeks later.

4. A 47-year-old woman comes to the physician because of a 1-week history of progressive left-sided weakness. Six months ago, she underwent an uncomplicated pancreatic transplant because of type 1 diabetes mellitus. Her medications are mycophenolate mofetil and prednisone. Vital signs are within normal limits. Muscle strength is 4/5 in the left lower aspect of the face and left upper extremity. Deep tendon reflexes are increased on the left. Sensation is intact. The remainder of the examination shows no abnormalities. An MRI of the brain shows a homogeneously enhancing right frontotemporal mass with surrounding edema. A biopsy specimen of the lesion shows proliferation of monoclonal B lymphocytes. Which of the following is the most likely causal organism?

A) Cytomegalovirus
B) Epstein-Barr virus
C) Human herpesvirus 6
D) JC virus
E) Varicella-zoster virus

Correct Answer: B.

Epstein-Barr virus (EBV) is a common inciting pathogen in the development of post-transplant lymphoproliferative disorder (PTLD), a condition that occasionally affects individuals after solid organ or stem cell transplant who remain on high doses of immunosuppressive medications. Primary EBV infection is exceedingly common and presents commonly as mononucleosis in immunocompetent patients. The virus primarily infects B lymphocytes, which present viral antigens on their surfaces, leading to T lymphocyte stimulation with subsequent destruction of the affected B lymphocytes. Some infected cells, however, are able to evade immune surveillance and persist in the host. In patients receiving high doses of immunosuppressive medications, or in those whose T lymphocyte population has been ablated, the loss of T lymphocyte surveillance allows for proliferation of B lymphocytes that continue to harbor the virus. This can lead to PTLD. Clinical manifestations vary greatly and depend primarily upon the location in which infected B lymphocytes replicate. Up to half of patients present with a discrete extra-nodal mass. Treatment always includes reduction of immunosuppressive medications, and depending upon the severity, may also include the use of rituximab with or without classic B lymphocyte lymphoma regimens.

Incorrect Answers: A, C, D, and E.

Cytomegalovirus (Choice A) can cause a mononucleosis-like syndrome in immunocompetent patients but can cause a variety of other diseases in patients who are immunodeficient, including esophagitis, retinitis, pneumonitis, and colitis, but it is not frequently the causal pathogen identified in PTLD.

Human herpesvirus 6 (Choice C) can cause pneumonitis, myelitis, encephalitis, and hepatitis in transplant recipients, however, is unlikely to be the causative agent of PTLD.

JC virus (Choice D) causes progressive multifocal leukoencephalopathy, a condition that can occur in patients after solid organ or bone marrow transplant as a result of reactivation of the JC virus. Classic clinical features include altered mental status, diplopia, seizures, ataxia, and motor deficits. Pathologic specimens show demyelination, not a monoclonal proliferation of B lymphocytes.

Varicella-zoster virus (Choice E) commonly causes primary infection in children, but reactivation later in life can lead to a painful eruption of vesicular lesions within one or two adjacent dermatomes. Patients who are immunosuppressed can sometimes develop disseminated zoster infection, but this patient's brain mass is not typical of this disease.

Educational Objective: PTLD may occur in patients after solid organ or stem cell transplants as a result of reactivation of latent EBV infection. Clinical symptoms depend upon the location of the subsequent B lymphocyte mass, and treatment involves de-escalation of immunosuppression with or without rituximab and regimens for primary B lymphocyte neoplasms.

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5. A previously healthy 52-year-old woman is brought to the physician because of a 1-month history of progressive fatigue and low back pain. Vital signs are within normal limits. Examination shows diffuse tenderness to fist percussion over the lumbar spine. Laboratory studies show:

Hematocrit	30%
Leukocyte count	9500/mm^3
Segmented neutrophils	65%
Bands	5%
Lymphocytes	10%
Monocytes	20%
Platelet count	200,000/mm^3
Serum	
Ca^{2+}	14 mg/dL
Urea nitrogen	60 mg/dL
Urine protein	4+

A protein electrophoresis shows monoclonal gammopathy. X-rays of the back show severe osteoporosis of the lumbar and thoracic spine without fracture. Examination of the bone marrow shows sheets of plasma cells. Cytogenetic analysis of the bone marrow shows no abnormalities. Which of the following is most likely to be increased in this patient?

A) Erythroid stem cells
B) Megakaryocytic stem cells
C) Monoclonal B-lymphocytes
D) Monoclonal T-lymphocytes
E) Myeloid stem cells
F) Pluripotent stem cells
G) Polyclonal B-lymphocytes
H) Polyclonal T-lymphocytes

Correct Answer: C.

Monoclonal B-lymphocytes are the most likely cell type to be increased in this patient with probable multiple myeloma. While a monoclonal gammopathy (M-spike) may occur in a variety of B-lymphocyte malignancies including Waldenström macroglobulinemia, plasma cell leukemia, smoldering myeloma, amyloidosis, or plasmacytoma, it is most commonly recognized in the setting of multiple myeloma (MM). Other signs and symptoms of MM include bone pain, anemia, hypercalcemia, kidney dysfunction, and lytic bone lesions, many of which are apparent in this patient. B-lymphocytes are precursors to plasma cells, which secrete specific immunoglobulins of different classes and are considered terminally differentiated B-lymphocytes. MM is a malignancy caused by the neoplastic proliferation of a single plasma cell clone, which overproduces monoclonal immunoglobulin and light or heavy chains. These clonal immunoglobulins are secreted in high numbers and appear as a monoclonal spike on protein electrophoresis in the gamma region on protein electrophoresis. Diagnosis of multiple myeloma is suspected based on the presence of an M-protein spike in the presence of concerning symptoms, but is confirmed by bone marrow biopsy, which must demonstrate at least 10% clonal plasma cells.

Incorrect Answers: A, B, D, E, F, G, and H.

Erythroid stem cells (Choice A) give rise to erythrocytes, which can be increased in number in conditions such as polycythemia vera.

Megakaryocytic stem cells (Choice B) are the precursors to platelets and are not increased in patients with MM. In many instances, displacement of normal bone marrow cells by malignant plasma cells can lead to thrombocytopenia.

Monoclonal T-lymphocyte (Choice D) expansion defines T-cell lymphoma but would not be expected in a patient with MM, which is a disease of differentiated B-lymphocytes.

Myeloid stem cells (Choice E) may become malignant through various mechanisms, ultimately resulting in the development of acute myeloid leukemia. Patients with this condition would have myeloblasts apparent on peripheral blood smear.

Pluripotent stem cells (Choice F) describe a population of cells that has the potential to become numerous different types of differentiated cells. MM is a disease of B-lymphocytes, which are already differentiated.

Polyclonal B-lymphocytes (Choice G) are often found in increased numbers in response to viral infections. MM is defined by a monoclonal population, not a polyclonal population of B-lymphocytes.

Polyclonal T-lymphocytes (Choice H) is incorrect as MM is caused by a proliferation of monoclonal B-lymphocytes, not T-lymphocytes.

Educational Objective: An M-spike denotes a monoclonal concentration of immunoglobulins secreted from a population of monoclonal plasma cells. While M-spikes are encountered in several malignancies, they are most commonly seen in multiple myeloma, which is a disorder of clonal plasma cell proliferation. Plasma cells are terminally differentiated B lymphocytes and thus, this is considered a B-lymphocyte malignancy.

6. A 22-year-old woman comes to the physician because of a 2-week history of yellowing skin and increasing shortness of breath on exertion. She has not had abdominal pain or weight loss. She does not smoke cigarettes or use illicit drugs. She drinks one to two beers on weekends. Her pulse is 80/min, respirations are 12/min, and blood pressure is 100/70 mm Hg. Examination shows scleral icterus and jaundice. The lungs are clear to auscultation. Abdominal examination shows a liver span of 10 cm, and the spleen tip is palpated 3 cm below the left costal margin. The remainder of the examination shows no abnormalities. Her hematocrit is 20%, and reticulocyte count is 10%. Additional serum studies are most likely to show which of the following?

	Indirect Bilirubin (mg/dL)	Lactate Dehydrogenase (U/L)	Alkaline Phosphatase (U/L)
A)	0.5	50	50
B)	0.5	50	500
C)	0.5	500	50
D)	0.5	500	500
E)	3.5	50	50
F)	3.5	50	500
G)	3.5	500	50
H)	3.5	500	500

Correct Answer: G.

Increased concentration of indirect bilirubin and lactate dehydrogenase (LDH) with normal levels of alkaline phosphatase (ALP) would be expected in this patient who has a clinical presentation consistent with hemolysis. Hemolysis describes a process whereby erythrocytes undergo cell lysis, and it may occur either intravascularly, with release of free hemoglobin into the circulation, or extravascularly within the spleen and reticuloendothelial system through the action of macrophages. Free hemoglobin is broken down into iron and heme. Heme is further reduced to biliverdin and then to unconjugated (indirect) bilirubin, so increased erythrocyte turnover leads to increased concentration of indirect bilirubin. LDH is also present in large concentrations within erythrocytes, so hemolysis also leads to increased concentration of LDH. Furthermore, the subsequent anemia that develops as a result of hemolysis induces the bone marrow to increase production of erythrocytes, and stimulates early release of immature erythrocytes, also known as reticulocytes, into the circulation.

Incorrect Answers: A, B, C, D, E, F, and H.

Normal concentration of indirect bilirubin, LDH, and ALP (Choice A) would be expected in patients without hemolysis or biliary obstruction.

Normal concentration of indirect bilirubin and LDH with increased concentration of ALP (Choice B) is suggestive of intrahepatic or extrahepatic biliary obstruction. Measurement of conjugated (direct) bilirubin would be a useful adjunct in such a situation, as this would also be increased in cases of biliary obstruction.

Normal indirect bilirubin and ALP with increased LDH (Choice C) is nonspecific but can be seen in various malignancies or infection.

Normal indirect bilirubin with increased concentration of ALP and LDH (Choice D) are not suggestive of hemolysis but may be suggestive of malignancy.

Increased concentration of indirect bilirubin with normal LDH and ALP (Choice E) are seen in benign liver conditions such as Gilbert syndrome, which results from a deficiency in the enzyme required to conjugate bilirubin.

Increased concentration of indirect bilirubin and ALP with normal LDH (Choice F) may suggest biliary obstruction, but measurement of direct bilirubin would be necessary in this instance.

Increased levels of indirect bilirubin, LDH, and ALP (Choice H) can be seen in a variety of conditions so measurement of additional markers such as haptoglobin, liver associated enzymes, γ-glutamyltransferase, and coagulation tests would be useful to further delineate the cause.

Educational Objective: Hemolysis can occur within the vessels (intravascular), in the reticuloendothelial system (extravascular), or in both. Extravascular hemolysis commonly results in splenomegaly, as seen in this patient. Patients with hemolysis present with varying degrees of anemia and reticulocytosis in addition to increased concentration of indirect bilirubin and LDH. Direct bilirubin and ALP, both of which are increased in instances of biliary obstruction, should be normal.

7. A 27-year-old man is brought to the emergency department by his family because of bizarre behavior for 3 hours. He has a 10-year history of schizophrenia treated with olanzapine. He and his family are driving across the country, and he was seen in another emergency department last night for an episode of agitation; his agitation resolved after intramuscular administration of haloperidol. On arrival, he is moaning and agitated and lies on the examination table with his arms held rigidly at his side. The mouth is open, and there is maximal upward deviation of the eyes. When asked to try to relax and look at the examiner, the patient says he cannot. His pulse is 110/min, and blood pressure is 154/86 mm Hg. Examination shows muscular rigidity. Which of the following is the most appropriate next step in management?

A) CT scan of the head
B) Administration of diphenhydramine
C) Administration of haloperidol
D) Administration of trazodone
E) EEG

Correct Answer: B.

Acute dystonic reactions are involuntary, painful muscle spasms that occur most frequently in response to potent dopamine-2 (D_2) antagonists such as typical antipsychotics (eg, haloperidol). Common presentations include torticollis (head tilted to the side and down), retrocollis (head tilted back), opisthotonos (arching of the back), and oculogyric crisis (deviation of the eyes). Patients rarely present with laryngospasm and stridor. The underlying pathophysiology is an imbalance in the dopaminergic-cholinergic pathways of the basal ganglia. Risk factors for development include male sex, young age, recent cocaine use, and a history of previous acute dystonic reaction. Acute dystonic reactions are treated with diphenhydramine or benztropine, which are both anticholinergic medications that work to restore the proper balance in the dopaminergic and cholinergic pathways. Neuroleptic malignant syndrome is an important, life-threatening differential consideration that should be excluded.

Incorrect Answers: A, C, D, and E.

CT scan of the head (Choice A) would assist in identifying sequelae of acute head trauma (eg, hematoma) or tumor. This patient possesses no history of head trauma, and a localized brain lesion would not explain his generalized muscle spasms.

Administration of haloperidol (Choice C) would assist in treating agitation related to psychosis. However, this patient's agitation is more likely related to the painful muscle spasms of acute dystonia. Haloperidol would likely worsen the muscle spasms and associated agitation.

Administration of trazodone (Choice D), a serotonin modulator, commonly assists with insomnia. Trazodone is not typically utilized to treat acute dystonic reactions.

EEG (Choice E) would assist in diagnosing a seizure. If this patient's generalized muscle spasms were caused by a seizure, he would be unresponsive. This patient is able to speak coherently with the physician, and his muscle spasms correlate with the administration of haloperidol, which is more consistent with acute dystonic reaction.

Educational Objective: An acute dystonic reaction most commonly occurs in response to typical antipsychotics and presents with torticollis, retrocollis, opisthotonos, and/or oculogyric crisis. Treatment involves anticholinergic medications, such as diphenhydramine or benztropine, which restore the dopaminergic-cholinergic balance in the basal ganglia.

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8. A 25-year-old man who is a nursing student comes to the office because of anxiety about his ability to pass his courses. He says that yesterday, during his first practical session, he had what he thought was a panic attack at the sight of blood. He says, "My heart began racing. I felt light-headed, and I almost got sick to my stomach." He says he has always felt squeamish at the sight of blood but thought he would eventually get used to it. He does not think he can be a nurse unless he receives help for this problem. He worries about how he will pay back his student loans and how he will explain his failure to his family. Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, he appears anxious and has a full range of affect. His thought process and content are clear and goal directed. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Anxiety disorder due to another medical condition
C) Generalized anxiety disorder
D) Panic disorder
E) Social anxiety disorder (social phobia)
F) Specific phobia
G) Normal reaction to a stressful event

Correct Answer: F.

Specific phobia is a psychiatric disorder featuring anxiety about a certain situation or object that commonly leads to avoidance behavior. Common phobias include flying, animals, enclosed spaces, and the sight of blood. To meet diagnostic criteria, the anxiety symptoms must be persistent (lasting greater than 6 months), and patients must demonstrate distress or social/occupational impairment. The anxiety may center around exposure to or anticipation of the stimulus. Long-term cognitive-behavioral therapy is the most effective treatment, though short-term benzodiazepines may be utilized in certain patients whose feared situations occur infrequently.

Incorrect Answers: A, B, C, D, E, and G.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient does not possess a history of a recent trauma.

Anxiety disorder due to another medical condition (Choice B) refers to anxiety that is a physiological consequence of a medical condition (eg, hyperthyroidism). This patient with normal vital signs and physical examination is unlikely to have an underlying medical condition explaining his anxiety.

Generalized anxiety disorder (Choice C) features persistent anxiety and worry about multiple domains of life in a manner that impairs professional, personal, or social functioning. This patient has a specific targeted fear and no signs of persistent worry about other areas of life.

Panic disorder (Choice D) is characterized by recurrent panic attacks that are unexpected (occur without a recognizable trigger). This patient's panic symptoms are triggered by the sight of blood.

Social anxiety disorder (social phobia) (Choice E) refers to excessive fear of scrutiny or embarrassment in social and/or performance situations. This patient's fear of failing his course is secondary to his fear of blood.

Normal reaction to a stressful event (Choice G) refers to stress that a typical person would experience as a result of a stressor. This patient's anxiety is leading to dysfunction in his role as a nursing student.

Educational Objective: Specific phobia is a psychiatric disorder featuring anxiety about a certain situation or object that causes significant distress or social/occupational impairment.

9. A 27-year-old man with an 8-year history of bipolar disorder comes to the physician because of depressed mood for 6 weeks. He reports that he no longer has an interest in his job as a salesclerk or in recreational activities. He has had a decreased appetite and low level of energy. He had been taking lithium carbonate for 6 years but stopped 3 months ago because he felt he no longer needed it. He currently takes no medications. Physical examination shows no abnormalities. On mental status examination, he says he has thought about suicide occasionally but has no plans to kill himself. Which of the following is the most appropriate pharmacotherapy at this time?

A) Lithium carbonate
B) Nortriptyline
C) Risperidone
D) Sertraline
E) Valproic acid

Correct Answer: A.

Bipolar disorder is a mood disorder characterized by discrete episodes of depression and mania. Depressive episodes are characterized by depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). This patient is experiencing an acute depressive episode in the setting of medication nonadherence, a common barrier to effective treatment in patients with bipolar disorder. Lithium carbonate is a mood stabilizing medication with utility in acute mania, acute depression, and maintenance bipolar disorder treatment. This patient's longstanding history of taking lithium carbonate indicates that this medication was likely helpful and well tolerated, warranting that lithium carbonate be resumed. Other first-line medications for acute depressive episodes in patients with bipolar disorder include lamotrigine, quetiapine, and lurasidone. Once acute mood episodes resolve, patients with bipolar disorder should continue mood stabilizer maintenance therapy to prevent future episodes of mania or depression. The physician should provide psychoeducation about the need for medication (even when mood is neutral) to improve this patient's adherence and consider a referral for psychotherapy to address barriers to adherence.

Incorrect Answers: B, C, D, and E.

Nortriptyline (Choice B) is a tricyclic antidepressant. Sertraline (Choice D) is a selective serotonin reuptake inhibitor. Both are utilized for unipolar major depressive disorder. In patients with bipolar disorder, these medications may worsen mania or convert depression to mania.

Risperidone (Choice C), an atypical antipsychotic medication with mood stabilizing properties, is often utilized in bipolar disorder and schizophrenia. In patients with bipolar disorder, risperidone is more effective for acute mania than acute depression or maintenance therapy. As well, this patient has a history of stability on lithium carbonate, so resuming lithium carbonate is the most appropriate option.

Valproic acid (Choice E) is an antiepileptic drug and mood stabilizer utilized commonly to treat acute mania or as maintenance bipolar disorder treatment. It is less effective in acute bipolar depression. As well, this patient has a history of stability on lithium carbonate, so resuming lithium carbonate is the most appropriate option.

Educational Objective: Lamotrigine, lithium carbonate, quetiapine, and lurasidone are the most effective treatments for acute depressive episodes in patients with bipolar disorder. In patients with mood episodes secondary to poor medication adherence and a history of stability on that medication, resuming the effective medication is commonly indicated.

10. A 17-year-old boy is bought to the emergency department by his parents because of slurred speech, sleepiness, and an inability to walk properly since he returned home from his friend's house 30 minutes ago. The patient's parents say that he has been socializing with the "wrong" crowd during the past year; they worry he has been experimenting with drugs and alcohol because he shows little interest in family activities. On arrival, he responds only to sternal rub. His pulse is 100/min, respirations are 12/min, and blood pressure is 90/60 mm Hg. The pupils are equal and reactive to light. Speech is slurred. Pulmonary examination shows no abnormalities. The remainder of the neurologic examination shows no focal findings. His serum glucose concentration is 35 mg/dL, and arterial pH is 7.3. Toxicity from which of the following is the most likely explanation for this patient's symptoms?

A) Cocaine
B) Diazepam
C) Ethanol
D) Heroin
E) Marijuana

Correct Answer: C.

About two-thirds of individuals in the United States have consumed alcohol (ethanol) by age 18. About 10 percent of 16- to 17-year-olds engage in a binge pattern of use, and some adolescents engage in chronic heavy use. Alcohol is a central nervous system (CNS) depressant. Alcohol intoxication commonly presents with emotional lability, disinhibition, sedation, slurred speech, and ataxia. Severely intoxicated patients may present with a decreased level of consciousness (eg, coma). Clinical findings commonly include behavioral disturbances, a scent of alcohol on the breath, normally reactive pupils, slurring of speech, gait instability, and, in severe intoxication, slow respirations. Chronic heavy alcohol use can lead to hypoglycemia and alcoholic ketoacidosis, as in this patient, caused by malnutrition and alcohol's effects on glucose metabolism. Treatment should focus on: maintaining a safe environment; protecting the patient and others from harm; monitoring and managing the patient's airway and breathing in the event of emesis, oversedation, or coma; supporting hydration; repleting deficient vitamins and electrolytes in cases of chronic or severe intoxication. In severe cases of alcohol intoxication that lead to coma, intubation may be required to protect the airway. In this case, the patient should receive vitamin repletion along with glucose in addition to any other indicated supportive care.

Incorrect Answers: A, B, D, and E.

Cocaine (Choice A) intoxication typically causes elevated mood, pressured speech, tachycardia, and hypertension. It does not typically lead to CNS depression, slurred speech, or ataxia.

Diazepam (Choice B), a benzodiazepine medication, commonly causes CNS depression, slurred speech, ataxia, emotional lability, and memory lapses. However, alcohol use is much more common than benzodiazepine use in adolescents. Further, benzodiazepines do not typically cause hypoglycemia or ketoacidosis.

Heroin (Choice D) intoxication commonly presents with stupor, a depressed respiratory rate, and constricted pupils. This patient demonstrates a normal respiratory rate and does not demonstrate pupillary constriction. Ataxia and slurred speech are more consistent with alcohol intoxication.

Marijuana (Choice E) intoxication presents with flushed conjunctiva, hyperphagia, and mood changes which may range from lassitude to paranoia. CNS depression, ataxia, and slurred speech are more consistent with alcohol intoxication.

Educational Objective: Alcohol intoxication commonly presents with slurred speech, ataxia, emotional lability, and sedation. Chronic heavy alcohol use can lead to hypoglycemia and ketoacidosis. Alcohol use is relatively common in adolescent patients.

11. A 6-month-old female infant is brought to the office because of a 4-day history of irritability and difficulty sucking and a 2-week history of constipation. She is exclusively breast-fed but has stopped latching during the past 4 days. Her mother typically gives her a pacifier dipped in honey to quiet her when necessary, but the patient will no longer take the pacifier. She has not had fever, cough, or vomiting. She appears lethargic and has a weak cry. Her temperature is 37.0°C (98.6°F), pulse is 100/min, respirations are 40/min, and blood pressure is 70/50 mm Hg. Examination shows bilateral ptosis, facial weakness, and poor head control. The pupils are sluggishly reactive to light. Gag reflex is diminished. Muscle strength is 2/5 in the upper extremities and 3/5 in the lower extremities. Deep tendon reflexes are absent in all extremities. Sensation is intact throughout. Which of the following is the most appropriate next step in diagnosis?

A) Blood culture
B) Lumbar puncture for cerebrospinal fluid analysis
C) MRI of the spine
D) Muscle biopsy
E) Repetitive nerve stimulation study

Correct Answer: E.

Botulism is an acute disease of the neuromuscular junction caused by the exposure to the *Clostridium botulinum* toxin. *C. botulinum* is a Gram-positive, spore-forming, obligate anaerobic bacterium. It produces botulinum toxin, a potent neurotoxin that is absorbed into the end-terminal of cholinergic motor neurons, where it cleaves SNARE proteins, thereby preventing the release of acetylcholine vesicles into the neuromuscular junction. Botulism is often encountered as a food-borne illness through contaminated food products. Historically, *C. botulinum* was responsible for outbreaks of “sausage poisoning” through contaminated ham products, and acquired its name after the Latin for sausage, “botulus.” In the modern era, it is more often responsible for poisoning via the ingestion of raw honey or canned foods. In infants, infection most commonly occurs through inhalation of spores from contaminated soil or dust, however, another common route of exposure is the ingestion of spores in honey when a parent feeds it to a child. The infant gastrointestinal flora is not sufficiently mature to prevent infection. Botulism presents with rapidly progressive, symmetric hypotonia and hyporeflexia that begins with the cranial nerves, manifesting as ptosis, sluggish pupils, and a diminished gag reflex, and descends to the lower extremities, as well as causes constipation, poor feeding, and respiratory failure. The diagnosis is supported by a characteristic low amplitude response on repetitive nerve stimulation studies (electromyography) that improves with repeated stimulation. Treatment requires hospitalization and administration of immune globulin, as well as supportive care, which often includes mechanical ventilation.

Incorrect Answers: A, B, C, and D.

Blood culture (Choice A) may disclose C. botulinum in anaerobic bottles, however, unless the bacterium has invaded the bloodstream, cultures will disclose no abnormalities. Nerve stimulation studies are a more appropriate initial step, as the characteristic response to repetitive stimulation can support the diagnosis and allow for timely treatment.

Lumbar puncture for cerebrospinal fluid analysis (Choice B) is useful for the diagnosis of meningitis, encephalitis, or Guillain-Barre syndrome, which is characterized by a rapid-onset, ascending paralysis. This infant’s presentation, with rapid, descending, flaccid paralysis is more suggestive of botulism.

MRI of the spine (Choice C) may disclose enhancement of the cauda equina and spinal ganglia in Guillain-Barre syndrome but is typically normal in botulism.

Muscle biopsy (Choice D) is useful for the diagnosis of muscular dystrophies, such as Duchenne or Becker muscular dystrophy. These disorders are inherited in an X-linked recessive manner and rarely affect female patients. Currently, genetic sequencing is commonly performed as a confirmatory test for muscular dystrophies.

Educational Objective: Botulism is an acute disease of the neuromuscular junction caused by exposure to the *C. botulinum* toxin. It presents with rapidly progressive, symmetric hypotonia and hyporeflexia that begins with the cranial nerves, manifesting as ptosis, sluggish pupils, and a diminished gag reflex, and descends to the lower extremities, as well as causes constipation, poor feeding, and respiratory failure. The diagnosis is supported by a characteristic low amplitude response on repetitive nerve stimulation studies that improves with repeated stimulation.

12. A 77-year-old man is brought to the emergency department by his son 4 hours after he became dizzy and was unable to stand. He has a history of intermittent atrial fibrillation and hypertension well controlled with digoxin and hydrochlorothiazide. His speech is dysarthric. His temperature is 37°C (98.6°F), pulse is 80/min and irregularly irregular, respirations are 12/min, and blood pressure is 140/90 mm Hg. Examination shows right-beating nystagmus and left ptosis. The left pupil is smaller than the right, especially in the dark. Sensation to pain and temperature is decreased over the left side of the face and right side of the body. The left upper and lower extremities are ataxic. An ECG shows atrial fibrillation. A CT scan of the head shows no abnormalities. Carotid ultrasonography shows 40% stenosis of the left internal carotid artery and 60% stenosis of the right internal carotid artery. Which of the following is the most appropriate next step in management to prevent recurrent cerebral infarction in this patient?

A) Aspirin therapy
B) Clopidogrel therapy
C) Warfarin therapy
D) Left carotid endarterectomy
E) Right carotid endarterectomy

Correct Answer: C.

This patient with a likely thromboembolic cerebral infarction (stroke) from atrial fibrillation would benefit from anticoagulant therapy. Strokes occur because of ischemic or hemorrhagic loss of blood supply to the brain and manifest as focal neurological deficits related to the dysfunction of the affected brain region. Approximately 80 to 85% of strokes are ischemic, commonly arising from thromboembolic disease, for which atrial fibrillation is a major risk factor. Atrial fibrillation typically presents with palpitations, fatigue, lightheadedness, and mild dyspnea if symptomatic. On ECG, atrial fibrillation demonstrates irregularly irregular RR intervals without discernible P waves. Prolonged atrial fibrillation leads to left atrial hemostasis and increases the risk of thrombosis. A thrombus from this patient's left atrium likely embolized through the aorta to the left subclavian artery, then to the left vertebral artery. Occlusion of the vertebral artery commonly affects the brain stem, cerebellum, and occipital lobes. Patients typically present with vestibulocerebellar signs (eg, vertigo, nystagmus, ataxia), ipsilateral cranial nerve dysfunction, contralateral hemiparesis, and contralateral impairment in pain and temperature sensation. Patients with paroxysmal or chronic atrial fibrillation should be initiated on therapeutic anticoagulation (eg, warfarin) to prevent thromboembolic events such as recurrent strokes.

Incorrect Answers: A, B, D, and E.

Aspirin (Choice A) and clopidogrel (Choice B) are antiplatelet agents utilized to prevent recurrent strokes in patients without atrial fibrillation who have experienced transient ischemic attacks or strokes. However, aspirin and clopidogrel are not anticoagulant agents and therefore do not adequately prevent recurrent strokes in patients with a history of atrial fibrillation.

Left and right carotid endarterectomies (Choices D and E) are utilized to treat symptomatic moderate to severe carotid artery stenosis. The internal carotid artery supplies the anterior and middle cerebral arteries, vascularizing the primary motor and sensory cortices. Therefore, occlusion of the internal carotid artery typically leads to contralateral hemiparesis and contralateral sensory deficit of the face and upper extremities without vestibulocerebellar or brainstem signs.

Educational Objective: Patients with atrial fibrillation are susceptible to left atrial hemostasis and consequent thromboembolic cerebral infarctions. Patients with atrial fibrillation should be initiated on therapeutic anticoagulation therapy to prevent cerebral infarction. A thromboembolic cerebral infarction of the vertebral artery typically presents with vestibulocerebellar signs, ipsilateral cranial nerve dysfunction, contralateral hemiparesis, and contralateral impairment in pain and temperature sensation.

13. A 47-year-old man comes to the emergency department because of a 12-hour history of a spinning sensation that worsens when he closes his eyes. He has no history of similar symptoms or serious illness. He takes no medications. Vital signs are within normal limits. Examination shows horizontal-rotatory nystagmus on right lateral gaze. Hearing acuity is normal bilaterally. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Basilar migraine
B) Brain stem hemorrhage
C) Cerebellar infarction
D) Meniere disease
E) Vestibular neuronitis

Correct Answer: E.

Vestibular neuronitis, also known as vestibular neuritis, is caused by inflammation of the vestibular portion of cranial nerve VIII (the vestibulocochlear nerve). It commonly arises as an inflammatory consequence of viral infection. Vestibular neuronitis typically presents with acute vertigo, nausea, vomiting, nystagmus, and gait instability (vestibular symptoms), which are usually constant rather than episodic. The absence of visual input, when the patient closes his eyes, commonly worsens peripheral vertigo (vertigo caused by lesions of the vestibulocochlear nerve). Nystagmus is typically horizontal or rotatory; vertical nystagmus is a sign of a central cause of vertigo (eg, brainstem lesion). Patients do not commonly present with hearing loss unless there is concomitant involvement of the auditory portion of cranial nerve VIII, which is referred to as labyrinthitis. Vestibular neuronitis is typically self-limited, though a glucocorticoid taper may hasten recovery, and antiemetics and vertigo medications may reduce the severity of symptoms.

Incorrect Answers: A, B, C, and D.

Basilar migraine (Choice A) refers to a migraine headache that begins with brainstem aura symptoms such as vertigo, incoordination, tinnitus, hearing loss, diplopia, or dysarthria. These aura symptoms typically last only a few minutes to an hour and are followed by an occipital headache.

Brainstem hemorrhage (Choice B) may cause locked-in syndrome (pontine) or Wallenberg syndrome (lateral medullary). The latter typically presents with vertigo, nystagmus (horizontal, rotatory, or vertical), and ipsilateral ataxia, along with ipsilateral Horner syndrome, facial numbness, taste loss, dysarthria, dysphagia, and/or pain and temperature sensation deficits in the contralateral body. Isolated vestibular symptoms would be uncommon.

Cerebellar infarction (Choice C) may lead to gait ataxia, nystagmus, dizziness, limb dysmetria, or dysarthria. Patients are typically unable to walk unsupported and commonly possess risk factors for ischemic stroke, inconsistent with this patient's presentation.

Meniere disease (Choice D) is a condition of vestibular dysfunction and sensorineural hearing loss that results from pressure accumulation in the endolymph of the inner ear. Patients typically present with episodic vertigo, hearing loss, and tinnitus. This patient's course is constant rather than episodic and does not include hearing loss.

Educational Objective: Vestibular neuronitis is caused by inflammation of the vestibular portion of the vestibulocochlear nerve. Vestibular neuronitis typically presents with acute vertigo, nausea, vomiting, nystagmus, and gait instability. Hearing loss is atypical. Vertical nystagmus and other nonvestibular symptoms would indicate a central cause of vertigo.

14. A 9-month-old girl is brought to the office because of a 5-day history of a rash in the diaper area. She has had two episodes of otitis media treated with oral antibiotic therapy but has been otherwise healthy. Her temperature is 37.0°C (98.6°F). A photograph of the rash is shown. Which of the following is the most appropriate pharmacotherapy?

A) Intravenous amphotericin B
B) Oral cephalexin
C) Oral ketoconazole
D) Topical mupirocin
E) Topical nystatin
F) No pharmacotherapy is indicated

Correct Answer: E.

Candidiasis can affect the mucous membranes or skin and is a common cause of diaper rash in young children. Cutaneous candidiasis commonly presents with red, macerated thin plaques with satellite papules, which helps to differentiate it from other causes of dermatitis. Infants with diaper dermatitis caused by candidiasis may also have other manifestations such as oral candidiasis, which demonstrates thick, white plaques on the tongue or buccal mucosa that can be scraped off with a tongue blade. Recent use of antibiotics increases the risk of developing candidal infections as a result of an imbalance of skin flora, which typically suppress the overgrowth of a single fungal organism. Treatment of superficial cutaneous candidiasis infections is with topical antifungal medications such as nystatin. Topical corticosteroids should be avoided as they can lead to worsening of the fungal infection.

Incorrect Answers: A, B, C, D, and F.

Systemic anti-fungals, such as intravenous amphotericin B (Choice A) or oral ketoconazole (Choice C), are not necessary in this case as the candidal infection is limited to the superficial epidermis where penetration by topical anti-fungal agents is excellent. Systemic antifungals are also accompanied by a significantly higher risk of adverse effects, such as liver dysfunction, than their relatively harmless topical counterparts.

As this patient's diaper rash is caused by a yeast infection, oral cephalexin (Choice B), a systemic antibiotic, is unnecessary. Furthermore, continued use of oral antibiotics may worsen this patient's infection as a result of continued skin flora dysregulation.

Topical mupirocin (Choice D) is effective in treating superficial bacterial infections such as impetigo. It does not have anti-fungal activity and will not resolve cutaneous candidal infections.

Cutaneous candidiasis can be painful and cause worsening disease if left untreated (Choice F). Treatment with topical nystatin cream is the first-line therapy.

Educational Objective: Candidiasis is a common cause of diaper rash and can be recognized by its red, macerated thin plaques with satellite papules. Topical nystatin cream is the first-line therapy in treating diaper candidiasis.

15. An 18-year-old woman comes to the physician because of a 4-year history of acne over her face. She has not sought treatment before today, and she is concerned about having clear skin before she leaves for college in 3 months. She uses water-based skin products and does not wear cosmetics. She has no history of serious illness, takes no medications, and has no known allergies. Menses occur at regular 28-day intervals. She is not sexually active. She is a competitive swimmer and trains 2 to 3 hours daily. Examination shows mild comedonal and papular acne over the face but no other abnormalities. Which of the following is the most appropriate initial step in management?

A) Use of bactericidal soap
B) Topical retinoid therapy
C) Oral contraceptive therapy
D) Oral isotretinoin therapy
E) Intralesional corticosteroid therapy
F) Intramuscular medroxyprogesterone therapy

Correct Answer: B.

Topical retinoid therapy is the first-line therapy indicated in this patient with mild acne vulgaris. The initial lesion of acne vulgaris is a comedone, a hair follicle that has been blocked by keratin debris. The inciting event in comedone formation is hyperproliferation of the epidermis and abnormal keratinization. Retinoids (vitamin A analogs) normalize keratinization and thus decrease the formation of new comedones. Topical retinoids, such as topical tretinoin, are used as the first-line treatment of mild and moderate acne. Because topical retinoids work through altering transcription of genes involved in the keratinization process, it is best used as a preventative therapy rather than to treat pre-existing acne lesions. Patients should be counseled to apply it over the entire involved area to prevent new comedone formation rather than applied as “spot treatment” only to existing lesions.

Incorrect Answers: A, C, D, E, and F.

Use of bactericidal soap (Choice A) is sometimes used as an adjuvant to topical retinoid therapy but is unlikely to be effective on its own in treating acne vulgaris.

Oral contraceptive therapy (Choice C) or intramuscular medroxyprogesterone therapy (Choice F) may be helpful in treating acne vulgaris when there is a hormonal component. This is indicated by cyclical flaring of the acne in conjunction with menstrual cycles and a predominance of lesions on the lower face, jawline, and chin, which are both absent in this case.

Oral isotretinoin therapy (Choice D), a systemic retinoid, is indicated in severe nodulocystic acne vulgaris, which is not present in this case. Topical retinoids are a more appropriate first-line therapy.

Intralesional corticosteroid therapy (Choice E) is not necessary in this case. In some cases of nodulocystic acne, a single nodule or cyst that is particularly inflamed and painful can be treated with intralesional corticosteroid injection to speed resolution of the lesion. However, this is accompanied by risk of atrophy and dyspigmentation and is not necessary in treating mild acne.

Educational Objective: Topical retinoids are first-line therapy for the treatment of mild to moderate acne vulgaris. They should be used over the entire involved area to prevent new comedone formation rather than applied as “spot treatment” only to existing lesions.

16. A 50-year-old man has had a swollen painful right elbow for 2 days. There is no history of trauma. He has rheumatoid arthritis involving the shoulders, fingers, elbows, knees, and ankles that has been well controlled with prednisone therapy for 4 months. He also takes ibuprofen and penicillamine. He had a painful vesicular rash in a dermatome distribution below his left breast 6 months ago. Two years ago, he was told that his rheumatoid process was affecting his lungs. He has been monogamous for 25 years. His temperature is 38.2°C (100.7°F), pulse is 80/min and regular, respirations are 20/min, and blood pressure is 140/80 mm Hg. His fingers, wrists, knees, and ankles show evidence of synovial proliferation; pain is minimal, and there is no warmth. His right elbow is swollen, warm, erythematous, and extremely tender. Laboratory studies show:

Hemoglobin	10.5 g/dL
Leukocyte count	16,800/mm^3
Segmented neutrophils	80%
Bands	10%
Lymphocytes	10%
Erythrocyte sedimentation rate	50 mm/h

Analysis of synovial fluid from the right elbow is turbid and shows a leukocyte count of 200,000/mm^3 (98% segmented neutrophils and 2% monocytes) and a glucose concentration of 10 mg/dL. Gram stain is negative. An x-ray of the chest shows a small right pleural effusion. Which of the following is the most likely causal organism?

A) *Borrelia burgdorferi*
B) *Coccidioides immitis*
C) Herpes zoster
D) *Mycobacterium tuberculosis*
E) *Staphylococcus aureus*

Correct Answer: E.

Septic arthritis classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. Septic arthritis results from a bacterial infection of the synovial joint space, most commonly by *Staphylococcus aureus*. The affected joint demonstrates pain upon passive range of motion, swelling, and erythema on examination. Arthrocentesis is indicated for the evaluation of monoarticular erythema and swelling to evaluate for septic arthritis, which characteristically shows purulent (neutrophilic predominant) synovial fluid with greater than 50,000 leukocytes/mm^3. Serum studies may also show leukocytosis and increased inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Treatment involves urgent intravenous antibiotics and source control, with patients often requiring irrigation of the joint in the operating room.

Incorrect Answers: A, B, C, and D.

Borrelia burgdorferi (Choice A) causes Lyme disease, which presents with arthralgia and erythema chronicum migrans, an expanding rash that may have a central ring-like clearing. Lyme disease requires a history of tick exposure and is less likely in this patient with a history of immunosuppression.

Coccidioides immitis (Choice B) is an endemic fungus of the Southwestern United States and the central valley of California that typically causes coccidioidomycosis, a self-limited respiratory illness. Signs and symptoms include fever, fatigue, pneumonia, arthralgia, and myalgia. Patients may also present with erythema nodosum. Disseminated coccidiomycosis affecting the joints is rare and is less likely in this patient than septic arthritis caused by *S. aureus*.

Herpes zoster (Choice C) commonly presents as a unilateral, dermatomal erythematous patch with overlying clear to yellow grouped vesicles. It is caused by varicella-zoster virus (VZV), also known as human herpesvirus-3 (HHV-3), which is transmitted via respiratory secretions and direct contact with infected skin lesions. It does not commonly cause septic arthritis.

Mycobacterium tuberculosis (Choice D) is a rare cause of septic arthritis. Tuberculous arthropathy should be considered in a patient with a suggestive history and with characteristic pulmonary findings. This patient's findings of a small pleural effusion are more consistent with pneumonia or rheumatic lung or pleural disease than with tuberculosis, which typically presents with apical cavitary lung lesions.

Educational Objective: Septic arthritis classically presents with a painful, erythematous, swollen joint with purulent joint fluid. *S. aureus* is the most common causative organism.

17. A 3-year-old girl is brought to the physician by her mother because of a 6-week history of intermittent, increasingly severe knee pain. Her mother says that initially the pain involved only the right knee, but during the past 2 weeks, her daughter also has had pain in the left knee, and the knees have felt warm and slightly swollen. The patient has not had fever or rash. She is alert and walks with a limp. She is at the 50th percentile for height and 25th percentile for weight. Her temperature is 36.8°C (98.2°F), pulse is 106/min, respirations are 24/min, and blood pressure is 86/48 mm Hg. Pupillary light reflexes are normal, and ocular movements are intact. The conjunctivae appear normal. No masses are noted in the neck. Cardiopulmonary examination shows no abnormalities. The abdomen is soft and nontender. Examination of the knees shows mild swelling and decreased range of motion because of pain. Laboratory studies show:

Erythrocyte sedimentation rate	32 mm/h
Antinuclear antibody	positive (1:640)
Rheumatoid factor	negative

Which of the following is the most appropriate screening test for this patient?

A) Slit-lamp examination
B) Measurement of serum thyroid-stimulating hormone concentration
C) Bone scan
D) Echocardiography
E) MRI of the hips

Correct Answer: A.

Juvenile rheumatoid arthritis (juvenile idiopathic arthritis, or JIA) occurs before the age of 16 and is a common rheumatic disease among children. The disease has an autoimmune cause and is characterized by joint pain and inflammation. Patients commonly exhibit extraarticular manifestations such as uveitis, lymphadenopathy, and rash. There are a variety of sub-categories of JIA, such as: oligoarticular disease, characterized by the involvement of fewer than five joints (typically large joints such as the knee) and antinuclear antibody (ANA) positivity; polyarticular disease, characterized by involvement of greater than five joints (typically both large and small joints such as the interphalangeal joints) and negative ANA titers; systemic disease (also known as juvenile onset Still disease), characterized by variable joint involvement, rash, quotidian fever, and serositis. JIA-associated uveitis is most common in female children with oligoarthritis and positive ANA titers. JIA-associated uveitis typically presents without any typical signs or symptoms of uveitis, such as conjunctival injection, photophobia, or blurry vision, and is often only detected once it has led to complications, such as cataract, glaucoma, or amblyopia. Without detection, the rate of ocular complications exceeds 65%, including devastating and often permanent vision loss. A slit-lamp examination allows for high magnification viewing of the anterior chamber and can detect subtle signs of intraocular inflammation. Treatment modalities for JIA include nonsteroidal anti-inflammatory drugs, disease modifying antirheumatic drugs such as methotrexate, and biologic agents. Many children with JIA-associated uveitis require cataract surgery.

Incorrect Answers: B, C, D, and E.

Measurement of serum thyroid-stimulating hormone concentration (Choice B) is useful for the diagnosis of thyroid disease. This patient's history of oligoarthritis, increased inflammatory markers, and ANA positivity is more suggestive of JIA.

Bone scan (Choice C) may show subtle changes in bone density suggestive of inflammation in JIA but is not commonly used as a screening tool for JIA.

Echocardiography (Choice D) may rarely disclose pericardial effusion in patients with JIA. This finding is likely to present with accompanying symptoms of pleuritic chest pain and muffled heart sounds and is less likely than uveitis in this patient.

MRI of the hips (Choice E) may disclose joint erosions or effusions in patients with active arthropathy but has low sensitivity and is not an optimal screening test.

Educational Objective: JIA-associated uveitis typically presents without typical signs or symptoms of uveitis, such as conjunctival injection, photophobia, or blurry vision, and is often only detected once it has led to complications, such as cataract, glaucoma, or amblyopia. Without detection, the rate of ocular complications exceeds 65%, including devastating and often permanent vision loss. A slit-lamp examination allows for high magnification viewing of the anterior chamber and can detect subtle signs of intraocular inflammation.

18. A 52-year-old man comes to the emergency department because of a 3-day history of severe pain in his left hip and thigh. He has a 3-year history of a daily cough productive of up to three tablespoons of yellow-tinged sputum. He also has a 10-year history of well-controlled hypertension. He has smoked one pack of cigarettes daily for 30 years. Vital signs are within normal limits. Examination shows marked restriction of movement of the left hip as a result of pain with movement. AP x-rays of the left lower extremity followed by CT scan show an impending fracture of the proximal femur in the area of a 3 × 3-cm radiolucent defect with focal breaching of the cortex laterally. CT scans of the chest and abdomen show a 5 × 3-cm spiculated density in the central right upper lobe of the lung; there is no lymphadenopathy or abdominal masses. Which of the following is the most likely diagnosis?

A) Adenocarcinoma
B) Enchondroma
C) Giant cell tumor of bone
D) Hodgkin disease
E) Osteosarcoma

Correct Answer: A.

In adults, the presence of a destructive bone lesion is more commonly caused by metastatic disease rather than a primary bone malignancy. Adenocarcinoma of the lung is the most common overall primary lung cancer and is also the most common among nonsmokers. It typically presents as a chronic consolidation in the periphery of the lung. Risk factors for all major types of lung cancer include tobacco use, secondhand smoke, asbestos or radon exposure, and a family history of lung cancer. Lung cancer in general typically presents with cough, unintentional weight loss, hemoptysis, chest pain, dyspnea, and hoarseness; occasionally, wheezing, focal rhonchi or hypertrophic osteoarthropathy may be noted on examination. Diagnosis is made by chest imaging and examination of a biopsy specimen. Prognosis is a function of the cancer type along with grading and staging of the disease. It is often detected once metastatic, at which point the prognosis is poor. Other types of cancer that commonly metastasize to bone include breast, thyroid, kidney, and prostate cancer.

Incorrect Answers: B, C, D, and E.

Enchondroma (Choice B) is a benign bone tumor that often occurs in the metacarpals and phalanges of the fingers. It is often painless and can be treated with observation alone. Ollier disease consists of multiple enchondromas that may present in a single extremity. Maffucci syndrome presents with multiple enchondromas and soft tissue angiomas.

Giant cell tumor of bone (Choice C) is generally nonmalignant but is aggressive and may invade local structures. It often arises in the distal femur. Histologically, it contain giant cells and mononuclear stromal cells. The presence of a spiculated lung lesion makes metastatic lung cancer a more likely diagnosis.

Hodgkin disease (Choice D) is a B-lymphocyte malignancy. Patients present with constitutional symptoms such as fever, night sweats, and unintentional weight loss. Extensive lymphadenopathy would be expected.

Osteosarcoma (Choice E) is the most common type of primary bone cancer and occurs frequently above the knee in the distal femur or below the knee in the proximal tibia. The initial presentation often includes pain and swelling; sometimes, a fragility fracture is the declaring presentation. It is most common in patients under 30 years of age.

Educational Objective: Destructive bone lesions in adults are most commonly the result of metastatic disease rather than a primary bone malignancy. Cancers that commonly metastasize to bone include lung, breast, thyroid, kidney, and prostate cancer.

19. A 32-year-old man comes to the physician because of a 2-month history of right groin pain. He is unable to work at his construction job because of his pain. He has no history of trauma or serious illness. He usually drinks six alcoholic beverages daily and occasionally has episodes of binge drinking. On examination, there is a 10-degree flexion contracture of the right hip. Any attempt at passive movement of the right hip produces pain. Flexion of the right hip is limited to 80 degrees, and internal rotation of the right hip is limited to the neutral position. X-rays of the right hip show lytic and sclerotic lesions of the femoral head. The joint space is intact. Which of the following is the most likely diagnosis?

A) Osteoarthritis
B) Osteomalacia
C) Osteonecrosis
D) Osteoporosis
E) Septic arthritis

Correct Answer: C.

Avascular necrosis, also known as osteonecrosis, of the femoral head results from impaired vascular supply to the bone with painful degeneration and loss of structural integrity over time. Reduced blood flow may result from direct injury to the blood vessel, compression by extrinsic structures or inflammation, venous occlusion, or thromboembolism. Numerous causes are associated, including trauma (fractures and dislocations), alcohol use disorder, systemic corticosteroid use, sickle cell disease, bisphosphonate therapy, and Gaucher disease. Idiopathic osteonecrosis is called Legg-Calve-Perthes disease, which most commonly occurs in children between the ages of 4 and 10 years old. Patients typically present with groin, thigh, or buttock pain, and limited range of movement at the hip. X-rays may suggest osteonecrotic changes while MRI is the gold standard for diagnosis. Treatment requires consultation with an orthopedic surgeon and physical therapy to preserve the native joint and maintain function.

Incorrect Answers: A, B, D, and E.

Osteoarthritis (Choice A) is a degenerative condition affecting the articular cartilage of joints and is one of the most common diseases afflicting adults. Repetitive use, such as in heavy labor, is a risk factor. X-rays would be expected to show joint space narrowing, osteophyte formation, and subchondral sclerosis, which are absent in this patient.

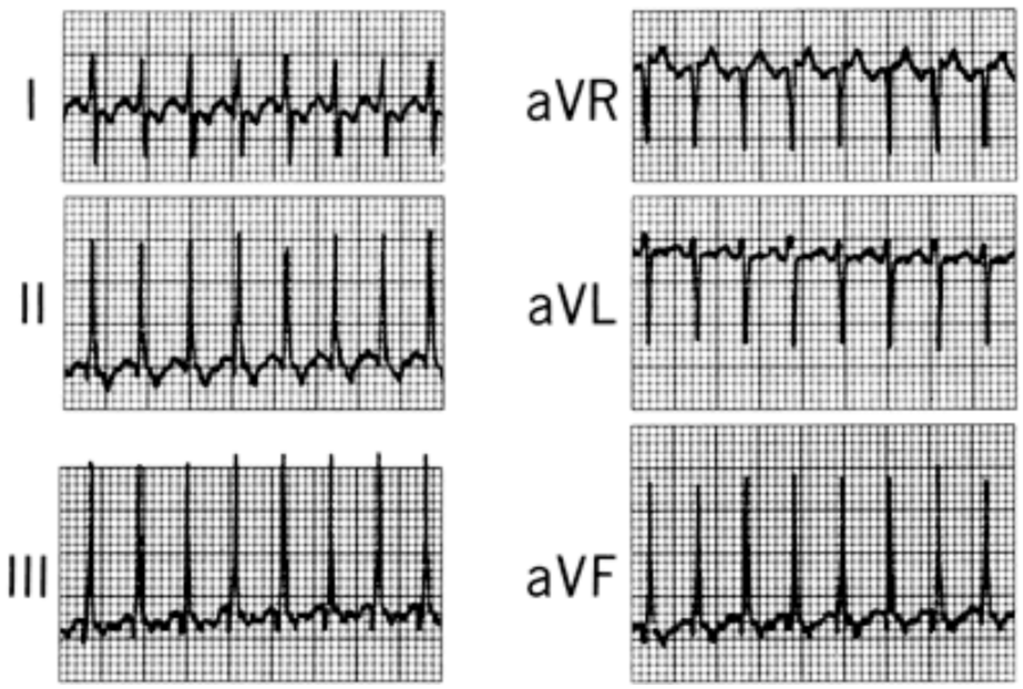
Osteomalacia (Choice B) is an adult form of vitamin D deficiency resulting in insufficient bone mineralization that may be caused by decreased gut absorption of vitamin D, insufficient exposure to sunlight, poor diet, or chronic kidney disease. Patients present with progressive bone pain and susceptibility to fragility fractures. X-rays would show increased bone lucency.

Osteoporosis (Choice D) is a metabolic bone disease resulting from unbalanced bone resorption and remodeling resulting in decreased bone density. Age, smoking, alcohol use, chronic inflammatory disease, and corticosteroid use are common risk factors. Similar to osteomalacia, patients are susceptible to fragility fractures and show reduced bone density on x-ray.

Septic arthritis (Choice E) results from bacterial infection of the synovial joint space, most commonly by *Staphylococcus aureus*. The affected joint demonstrates pain, swelling, and erythema, and patients generally present with a fever. Concomitant infection in the bone (osteomyelitis) may show destructive lesions on imaging.

Educational Objective: Osteonecrosis is caused by reduced vascular supply to bone and may result in bone degradation, pain, limited range of motion, and susceptibility to fractures. The femoral head is a common site in adults.

20. A 47-year-old man has tachycardia 3 days after undergoing emergency sigmoid colectomy for a perforated diverticulitis. One year ago, he had coronary artery stents inserted after sustaining an acute myocardial infarction. He has been receiving scheduled doses of propranolol. His pulse is 210/min; other vital signs are within normal limits. Examination shows no abnormalities. A 12-lead ECG is shown. Which of the following is the most appropriate treatment for this patient?



- A) Adenosine therapy
- B) Amiodarone therapy
- C) Digoxin therapy
- D) Metoprolol therapy
- E) Electrical cardioversion
- F) Placement of a pacemaker

Correct Answer: A.

The patient is displaying a stable supraventricular tachycardia (regular, narrow-complex without evidence of hypotension or impaired systemic perfusion). The initial steps in management are vagal maneuvers and the administration of intravenous adenosine in an attempt to terminate the rhythm or slow it down for better identification of the specific arrhythmia. Adenosine results in the short-acting blockade of atrioventricular (AV) nodal conduction and is effective in terminating a majority of supraventricular tachycardias.

Incorrect Answers: B, C, D, E, and F.

Amiodarone therapy (Choice B) is effective in the management of both ventricular and supraventricular tachycardias and may be used for refractory arrhythmias. Vagal maneuvers, adenosine, and additional AV-nodal blocking agents such as β-adrenergic blockers like metoprolol therapy (Choice D) or calcium channel blockers should be utilized first.

Digoxin therapy (Choice C) is effective in the chronic management of certain types of supraventricular tachyarrhythmias, especially if there is a component of heart failure as digoxin imparts positive inotropic effects. However, it should not be used as a first-line therapy in the acute management of supraventricular tachycardia.

Electrical cardioversion (Choice E) is emergently indicated if the patient is hemodynamically unstable. Evidence of clinical instability requiring electrical cardioversion over vagal maneuvers and pharmacotherapy include hypotension, altered mental status, angina, and respiratory distress.

Placement of a pacemaker (Choice F) is most commonly indicated for the management of symptomatic bradycardia, sinus node dysfunction, and AV nodal blocks. It does not have a role in the management of acute tachycardia.

Educational Objective: Stable supraventricular tachycardia should be acutely managed with vagal maneuvers and intravenous adenosine in an attempt to terminate or slow the arrhythmia, followed by AV-nodal blocking agents such as β-adrenergic blockers or calcium channel blockers, if refractory. If hemodynamic instability is present, the patient should undergo immediate electrical cardioversion.

21. A 57-year-old man comes to the office because of a 2-month history of intermittent chest pain. He describes the pain as a squeezing sensation in the center of his chest that lasts for 2 to 3 minutes. The pain worsens when he walks outside or becomes upset. He also has noted the pain after eating large meals. He has not had nausea or vomiting. He has hypertension, hypercholesterolemia, and osteoarthritis. Medications are hydrochlorothiazide, simvastatin, and acetaminophen. Family history is noncontributory. The patient does not smoke cigarettes. He is 178 cm (5 ft 10 in) tall and weighs 102 kg (225 lb); BMI is 32 kg/m^2. His pulse is 80/min, respirations are 12/min, and blood pressure is 142/92 mm Hg. Lungs are clear to auscultation. On cardiac examination, a regular rhythm and prominent S_4 are heard with no murmurs. ECG shows nonspecific ST-T wave abnormalities in leads V_3–V_4. Which of the following is the most likely diagnosis?

A) Angina pectoris
B) Esophageal spasm
C) Gastroesophageal reflux disease
D) Myocardial infarction
E) Pulmonary embolism

Correct Answer: A.

The patient's presentation is consistent with angina pectoris. It is most commonly caused by coronary artery disease (CAD) and is usually a result of atherosclerotic plaque buildup over many years. Depending on the degree of coronary artery stenosis, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work. Patients typically develop symptoms during exertion, heightened emotional states, and after heavy meals. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina. If myocardial ischemia is severe enough and not reversed, which occurs in cases of plaque rupture, it results in myocardial infarction. Many individuals with CAD will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Stress tests are employed in an attempt to identify areas of decreased perfusion.

Incorrect Answers: B, C, D, and E.

Esophageal spasm (Choice B) is a condition in which the muscular layer of the esophagus is overactive. These spasms cause severe dysphagia and chest pain, often acutely in the setting of swallowing. The patient's onset of symptoms during exercise and the presence of ST-T wave abnormalities on ECG argue against this diagnosis.

Gastroesophageal reflux disease (GERD) (Choice C) is a common condition that presents with chest discomfort, often in association with the consumption of a large meal or trigger food such as an acidic beverage, fatty food, coffee, chocolate, or tomato. It is often worse with supine positioning. It can be challenging to differentiate GERD from angina pectoris. The association of symptoms with exercise and becoming upset, as well as ST-T wave abnormalities, suggest angina pectoris, and it is important to evaluate for this acutely life-threatening condition before settling on a diagnosis.

Myocardial infarction (Choice D) indicates the presence of irreversible cell damage and necrosis resulting from impaired blood flow, most commonly caused by atherosclerotic plaque rupture. Patients classically present with acute-onset chest pain, often radiating to the neck, jaw, or arm, along with shortness of breath, nausea, or lightheadedness.

Pulmonary embolism (Choice E) classically presents with acute pleuritic chest pain, shortness of breath, and hypoxemia, often in a patient with deep venous thrombosis or a known hypercoagulable state. The ECG in the setting of a pulmonary embolus most commonly demonstrates sinus tachycardia, and if there is right heart strain can also exhibit right axis deviation, S wave in lead 1, Q wave in lead 3, and inverted T wave in lead 3 ('S1Q3T3').

Educational Objective: Angina pectoris results from a mismatch of myocardial perfusion and demand, most commonly caused by coronary artery disease and atherosclerotic plaque build-up. Patients typically develop symptoms during exertion, heightened emotional states, and after heavy meals.

22. A 68-year-old woman comes to the physician because of a 6-month history of shortness of breath with exertion and a sensation of pressure in her mid chest. Initially, her symptoms occurred after she walked up a second flight of stairs to her office; they resolved with 10 minutes of rest. During the past 4 months, her symptoms have begun as she finishes walking up the first flight of stairs. If she rests for 5 minutes, she is able to walk up the second flight of stairs. She has not had pain at rest, during the night, or after eating. She has no history of serious illness and takes no medications. There is no family history of serious illness. The patient has never smoked cigarettes. She appears in no distress. Vital signs are within normal limits. On cardiac examination, a grade 3/6 systolic ejection murmur is heard best at the base of the heart, and there is an S_4; there is radiation to the carotid arteries. Fasting serum lipid studies show:

Total cholesterol	217 mg/dL
HDL-cholesterol	59 mg/dL
LDL-cholesterol	140 mg/dL
Triglycerides	90 mg/dL

Results of other laboratory studies are within the reference ranges. An ECG shows non-specific ST-T wave changes. Echocardiography shows an ejection fraction of 45% and severe aortic valve stenosis. Which of the following is the most appropriate next step in management?

A) Afterload and preload reduction
B) Afterload reduction only
C) Balloon valvotomy
D) Preload reduction only
E) Valve replacement

Correct Answer: E.

Aortic stenosis (AS) is a common disorder of the aortic valve that results from fibrosis and calcification. While many patients may be asymptomatic, those with severe AS may complain of fatigue, shortness of breath, cough, diminished exercise tolerance, angina, or syncope with exertion. Examination findings include a crescendo-decrescendo systolic murmur best heard at the upper right sternal border with radiation to the carotids, and pulsus parvus et tardus (weak and delayed) may be noted on examination of peripheral pulses. As a result of the chronic increased afterload from a fixed obstruction by the valve, left ventricular hypertrophy and heart failure can occur. Valve replacement is indicated for patients with severe AS (as graded by echocardiographic findings) who are either symptomatic, or asymptomatic with evidence of systolic dysfunction, typically considered an ejection fraction less than 50%.

Incorrect Answers: A, B, C, and D.

Afterload and preload reduction (Choice A), and preload reduction only (Choice D) would not be appropriate in management as reduced preload causes decreased cardiac contractility and further lowers the transvalvular pressure gradient, resulting in decreased cardiac output.

Afterload reduction only (Choice B) may benefit patients with heart failure caused by a primary myocardial disease who also have concurrent aortic stenosis as this will increase the transvalvular pressure gradient and improve cardiac output. However, valve replacement is the recommended intervention for symptomatic severe aortic stenosis.

Balloon valvotomy (Choice C) is considered a second-line intervention for patients at too high a surgical risk to undergo valve replacement, or as a bridge to valve replacement in patients who are critically ill and cannot receive an immediate valve replacement.

Educational Objective: Patients with severe AS that results in symptoms or evidence of systolic dysfunction (ejection fraction <50%) should undergo aortic valve replacement for treatment.

23. A 55-year-old woman comes to the office for a health maintenance examination. She feels well. She has no history of serious illness and takes no medications. Her mother had hypertension and died of a cerebral infarction at the age of 78 years. The patient does not smoke cigarettes. She drinks one glass of red wine daily. She is 173 cm (5 ft 8 in) tall and weighs 70 kg (155 lb); BMI is 24 kg/m^2. Her blood pressure is 162/99 mm Hg. Examination shows no other abnormalities. Serum studies show:

Creatinine	0.8 mg/dL
Cholesterol, total	240 mg/dL
HDL-cholesterol	45 mg/dL
LDL-cholesterol	160 mg/dL
Triglycerides	140 mg/dL

Which of the following is the most appropriate next step in management?

A) Cardiac stress scintigraphy
B) Losartan therapy
C) Recommendation for cessation of alcohol consumption
D) Renal artery ultrasonography
E) Repeat blood pressure measurement in 1 week

Correct Answer: E.

Increased blood pressure (hypertension) may result from primary (essential) hypertension, believed to be related to increased systemic vascular resistance, or may be caused by a secondary cause such as Conn syndrome, pheochromocytoma, or renal artery stenosis, among others. Hypertension, regardless of cause, is a risk factor for atherosclerotic cardiovascular disease (eg, stroke, myocardial infarction), and control of hypertension should be a priority when considering prevention of these conditions. This patient presents without symptoms to her primary care office and has no significant medical history. Her family history is notable for a cerebrovascular accident in her mother. She has a borderline elevated BMI, and her blood pressure is within the range of Stage 2 hypertension (>160 mm Hg systolic). Incidental hypertension can occur in patients who are stressed, anxious, feeling pain, using stimulants, or in whom the reading was measured incorrectly. A single hypertensive-range blood pressure is insufficient to make a diagnosis of hypertension, and the best next step in a patient with an incidental note of hypertension is to repeat the pressure at a later date. If the pressure remains consistently increased in the absence of confounding factors, the diagnosis is established and a search for a secondary cause (if likely) along with consideration of treatment initiation should occur. The eighth Joint National Commission meeting recommended initiating therapy for hypertension using ACE inhibitors or angiotensin-receptor blockers, thiazide diuretics, or calcium channel blockers as first line options. This patient does have increased cholesterol, but her 10-year risk of atherosclerotic cardiovascular disease is less than 7.5% at this time, indicating that blood pressure management should be the primary goal.

Incorrect Answers: A, B, C, and D.

Cardiac stress scintigraphy (Choice A) is not indicated at this time. The patient does not display any signs or symptoms of angina or anginal equivalents. The American College of Cardiology recommends against performing stress tests in patients without symptoms or the presence of a high-risk indicator (eg, ECG changes).

Losartan therapy (Choice B) may be appropriate for this patient once the diagnosis of hypertension is established. An initial one-time reading is insufficient for diagnosis and should be followed by repeat assessment prior to the initiation of therapy.

Recommendation for cessation of alcohol consumption (Choice C) may be advised in patients with excess alcohol use (more than one drink daily for genetic females). This patient's single glass of red wine daily may actually convey a benefit in blood pressure management and does not require cessation at this time.

Renal artery ultrasonography (Choice D) would be appropriate in the evaluation of secondary hypertension, however at this time, the diagnosis remains to be established. Patients with renal artery stenosis (RAS) often demonstrate increased creatinine concentrations and hypertension with hypokalemia and metabolic alkalosis caused by increased activity of the renin-angiotensin-aldosterone system. Older patients may develop RAS as a result of atherosclerotic disease, while younger patients may develop it because of fibromuscular dysplasia or vasculitis.

Educational Objective: To establish a diagnosis of hypertension regardless of primary or secondary cause, serial blood pressure measurements must demonstrate increased pressures in the absence of confounding factors. Initiating workup or treatment before definitively establishing the diagnosis would be inappropriately premature. When an incidental asymptomatic hypertensive reading is noted, it is best to repeat the blood pressure measurement prior to determining a further course of action.

24. A 72-year-old man comes to the physician because of a 3-month history of swelling and discoloration of his right leg. He describes his symptoms as mildly uncomfortable but not painful. He received the diagnosis of deep venous thrombosis 8 months ago after undergoing total knee replacement; he received warfarin therapy for 6 months, and his INR remained at 2 to 3 during this period. He has hyperlipidemia treated with atorvastatin. Vital signs are within normal limits. Examination of the right lower extremity shows reddish-brown hyperpigmentation below the knee; there is edema and tenderness to palpation below the knee. There are well-healed arthroscopic scars over the knee. Distal pulses are intact. Venous duplex ultrasonography shows no abnormalities. Which of the following is the most likely diagnosis?

A) Pelvic vein thrombosis
B) Postphlebitic syndrome
C) Superficial phlebitis
D) Thrombophlebitis
E) Varicose veins

Correct Answer: B.

Postphlebitic, or post-thrombotic, syndrome is a condition characterized by chronic venous insufficiency that can develop after deep vein thrombosis (DVT). Obstruction of venous flow leads to venous hypertension, inflammation, and vein wall remodeling, which can result in valvular incompetence and chronic venous reflux. Symptoms and signs include edema, skin pigmentation changes, pain, vein dilation, and venous ulcer formation. These typically develop weeks to months following a DVT and may be intermittent or progressive. Age, obesity, recurrent DVT, proximal thrombosis, delayed initiation of antithrombotic therapy, and inadequate treatment of the thrombus are risk factors for development and severity of post-thrombotic syndrome. Prevention of DVT with thromboprophylaxis, along with early diagnosis and treatment of DVTs lower the risk.

Incorrect Answers: A, C, D, and E.

Pelvic vein thrombosis (Choice A) should be considered in the evaluation of a painful, swollen extremity with no thrombosis seen on venous duplex imaging as the pelvic vessels are difficult to assess during the study. However, this patient was adequately treated with anticoagulation, and a recurrent DVT would be unlikely in the setting of a previous provoked DVT. As well, pelvic vein thrombosis is more common in pregnancy than in the general population.

Superficial phlebitis (Choice C) is typically painful and associated with erythema, tenderness, and a palpable, thickened cord along the path of the affected vein. It is typically self-limited, though may recur in associated inflammatory conditions, such as Buerger disease. Thrombophlebitis (Choice D) refers to inflammation associated with an underlying thrombosis.

Varicose veins (Choice E) are dilated and tortuous superficial venous segments that often occur in the lower extremities as a result of valve incompetence. New varicose veins can form in the setting of post-thrombotic syndrome but would not explain the patient's presentation alone.

Educational Objective: Chronic venous insufficiency can develop after a DVT in a condition called postphlebitic, or post-thrombotic, syndrome. Patients may present with intermittent or persistent edema, pain, and skin discoloration.

25. A 32-year-old woman comes to the physician for a routine examination. She feels well. Two years ago, she underwent hysterectomy because of leiomyomata uteri. Her only medications are a multivitamin and calcium and vitamin D supplementation. She received the bCG vaccine as a child. Her mother was diagnosed with breast cancer at the age of 61 years. The patient emigrated from China 3 years ago. She does not smoke cigarettes or drink alcohol. She eats a "prudent" diet. She does not exercise. She works as a biologist studying obesity with murine models. She is sexually active and monogamous with her husband of 6 years. Vital signs are within normal limits. Examination shows no abnormalities. A PPD skin test shows 12 mm of induration at 48 hours. A chest x-ray shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Fasting serum lipid studies
B) Hepatitis A vaccination
C) Hepatitis B vaccination
D) Isoniazid therapy
E) Mammography

Correct Answer: D.

The patient should begin isoniazid therapy for treatment of potential latent tuberculosis (TB) infection (LTBI). Controlling the spread of TB relies on the diagnosis and management of patients with active TB infection and potential latent infection, which has a risk of reactivating into symptomatic, transmissible disease. There is no definitive test for LTBI, and diagnosis is based on clinical risk factors and a demonstrable immune response to TB antigens. The immune response may be demonstrated using the PPD skin test or an interferon-gamma release assay (IGRA). In this patient, receipt of the bCG vaccine in childhood can make interpretation of the PPD skin test challenging, as the immune response may be caused by the presence of latent TB or as a result of prior bCG vaccination. Given this, the Centers for Disease Control and Prevention recommend interpreting PPD skin test the same for bCG and non-bCG vaccinated individuals. In patients with greater than 10 mm induration on PPD skin test or a positive serum IGRA and a negative chest x-ray, treatment for LTBI should be initiated if they fall into one of the following high-risk groups: recent immigration from a high-prevalence country, injection drug use, resident or employee of a high-risk setting (eg, correctional facility, nursing home, homeless shelter, hospital), presence of significant medical comorbidities, or pediatric patients exposed to high-risk adults.

Incorrect Answers: A, B, C, and E.

Fasting serum lipid studies (Choice A) do not need to be checked at this time for this young, otherwise healthy patient. They may be considered for evaluation of a suspected dyslipidemia or as a screening panel in patients who have increased risk for cardiovascular disease or a positive family history of dyslipidemia.

Hepatitis A vaccination (Choice B) and hepatitis B vaccination (Choice C) should be considered for this patient after a review of risk factors and current immunization guidelines. However, treatment for potential latent TB infection in the setting of a high-risk patient and a positive PPD skin test should take priority.

Mammography (Choice E) is not indicated at this time. Current guidelines recommend breast cancer screening for all women over the age of 40 to 50 years with individual considerations for starting screening earlier in the setting of a high-risk genetic profile, positive family history, or increased lifetime risk of breast cancer based on a validated risk calculator.

Educational Objective: Latent TB infection is a clinical diagnosis based on a positive immune response to TB antigens and patient risk factors. Treatment with isoniazid should be initiated for patients with a positive PPD skin test or serum IGRA, negative chest x-ray, and positive risk factors.

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26. A 92-year-old woman comes to the physician because of a 2-month history of an enlarging lump in her neck. She has congestive heart failure and type 2 diabetes mellitus. Her medications are digoxin, hydrochlorothiazide, and metformin. She had smoked one pack of cigarettes daily for 55 years but quit 17 years ago. She appears well developed and well nourished. Her temperature is 37°C (98.6°F), pulse is 72/min and irregular, respirations are 20/min, and blood pressure is 150/80 mm Hg. Examination of the ears, nose, mouth, and posterior pharynx shows no abnormalities. A 3-cm, firm mass is palpated at the left mandibular angle. The remainder of the examination, including chest x-ray, shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) PPD skin test
B) Kveim test
C) CT scan of the chest
D) MRI of the brain and neck
E) Fine-needle aspiration of the mass

Correct Answer: E.

A new head or neck mass is concerning in an adult patient, with potential infectious, malignant, autoimmune, and anatomic causes. A careful and thorough evaluation is needed to rule out malignancy, especially in an older patient with a history of tobacco use. Other features that are suggestive of malignancy include a lack of infectious signs and symptoms (such as fever, erythema, pain), duration greater than 2 weeks, firm texture, fixed mobility, and a history of prior cancer or immunocompromised status. Patients may be asymptomatic or present with hoarseness or new voice changes, oropharyngeal ulcers, dysphagia, dyspnea, unexplained weight loss, or fatigue. Fine-needle aspiration of the mass should be attempted next to obtain biopsy samples for a definitive diagnosis. Histopathologic evaluation will also provide information about infectious and autoimmune causes.

Incorrect Answers: A, B, C, and D.

PPD skin test (Choice A) is not indicated at this time. Tuberculous lymphadenitis, or scrofula, is a common manifestation of extrapulmonary tuberculosis in endemic regions and often presents with isolated cervical lymphadenopathy.

Kveim test (Choice B) is used in research studies for the diagnosis of sarcoidosis by injecting spleen or lymph tissue from a patient with sarcoidosis into the dermis of the patient being tested to evaluate for a granulomatous response. It is not commonly used in clinical practice and not indicated for the evaluation of a new neck mass.

CT scan of the chest (Choice C) is unlikely to provide further diagnostic data at this time because of the submandibular location of the mass. A histopathologic evaluation for malignancy should be performed first with fine-needle aspiration. Additional CT or PET/CT imaging may be required, if malignancy is identified, for prognostic determinations and therapeutic planning.

MRI of the brain and neck (Choice D) is not currently needed because of accessibility of the mass for biopsy. MRI can be used for deeper masses that require soft tissue differentiation (especially infiltrative masses) or to evaluate for central nervous system lesions.

Educational Objective: The presence of a new head or neck mass in adult patients is concerning and should be evaluated thoroughly with a history, physical examination, imaging, and tissue analysis. A biopsy sample may be obtained by fine-needle aspiration, core biopsy, or excisional/surgical biopsy.

27. A 57-year-old woman with mixed connective tissue disease comes to the physician for a follow-up examination. She has a 6-month history of fatigue and progressive shortness of breath on exertion that improves within a few minutes of rest. She occasionally has a nonproductive cough when lying down. She has not noticed any wheezing. Her medications include prednisone and azathioprine. She works in an office as a secretary. She has never smoked cigarettes. She is 158 cm (5 ft 2 in) tall and weighs 70 kg (155 lb); BMI is 28 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 68/min, respirations are 16/min, and blood pressure is 120/72 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 97% at rest. Dry crackles are heard at both lung bases; they do not clear completely with coughing. Pedal pulses are 2+, and there is trace ankle edema bilaterally. Which of the following is the most appropriate next step in diagnosis?

A) Anticyclic citrullinated peptide antibody testing

B) Pulmonary function testing

C) Exercise stress testing

D) Polysomnography

E) Cardiac catheterization

Correct Answer: B.

This patient with a history of mixed connective tissue disease and progressive dyspnea, cough, and pulmonary crackles has likely developed interstitial lung disease (ILD) and should undergo pulmonary function testing as the next step in evaluation. ILD refers to the heterogeneous group of disorders that result in pulmonary fibrosis and progressively impaired lung function. Causes include infections, occupational and environmental exposures, drug-induced pulmonary toxicity, radiation-induced lung injury, connective tissue disorders, hypersensitivity pneumonitis, and idiopathic disease. Patients classically present with progressive dyspnea and chronic non-productive cough. Inspiratory crackles and hypertrophic osteoarthropathy may be present on physical examination. Usual interstitial pneumonitis (also called usual interstitial pneumonia) is the most common histopathologic and radiologic pattern of ILD. It is a pattern most commonly associated with idiopathic pulmonary fibrosis. Chest x-ray often shows peripheral and basilar predominant honeycombing (clustered cystic air spaces). Pulmonary function testing typically shows a restrictive spirometry pattern with a reduced diffusing capacity for carbon monoxide. Biopsy is not typically needed for diagnosis, but will show interstitial fibrosis in a patchwork pattern, honeycomb changes, and fibroblast foci. Over time, pulmonary fibrosis results in pulmonary hypertension and can lead to right heart dysfunction and failure, with reduced cardiac output, peripheral edema, and increased jugular venous distension.

Incorrect Answers: A, C, D, and E.

Anticyclic citrullinated peptide antibody testing (Choice A) is specific for rheumatoid arthritis. While rheumatoid arthritis is associated with pulmonary pathology, serum testing would not be useful at this point in evaluating this patient's new respiratory symptoms in the setting of a known mixed connective tissue disease.

Exercise stress testing (Choice C) and cardiac catheterization (Choice E) are useful if coronary artery disease is suspected as the cause for the patient's symptoms. Angina, dyspnea on exertion, and progressive heart failure are suggestive of coronary artery disease; however, the patient has specific risk factors for ILD and a more consistent presentation for pulmonary fibrosis.

Polysomnography (Choice D) is used to identify sleep apnea and other sleep-related breathing and movement disorders. It is useful in the evaluation of a patient with pulmonary hypertension of unclear cause, excessive daytime sleepiness and fatigue, and risk factors for obstructive sleep apnea (such as obesity, upper airway anatomic abnormalities, loud snoring).

Educational Objective: Pulmonary fibrosis results from chronic inflammation of the pulmonary interstitium, classically presenting with progressive dyspnea and a nonproductive cough.

28. A 62-year-old man comes to the physician because of a 4-week history of intermittent epigastric pain, nausea, and fatigue. He has not had any other symptoms. He has no history of serious illness and takes no medications. Vital signs are within normal limits. The abdomen is flat and nontender. Test of the stool for occult blood is positive. His hemoglobin concentration is 10 g/dL, and hematocrit is 30%. Esophagogastroduodenoscopy shows nonspecific gastritis with a few gastric ulcerations. Biopsy specimens of the gastric mucosa show mucosa-associated lymphoid tissue (MALT) lymphoma. Which of the following is the most appropriate initial step in management?

A) Antibiotic therapy
B) Chemotherapy only
C) Chemotherapy and radiation therapy
D) External beam radiotherapy
E) Subtotal gastrectomy

Correct Answer: A.

Mucosa-associated lymphoid tissue (MALT) lymphoma is a malignancy of B lymphocytes that originates within the marginal zone of gastrointestinal lymphoid follicles. While the pathogenesis of MALT lymphoma is complex, it is frequently associated with chronic inflammation of the gastrointestinal mucosa in the setting of infection with *Helicobacter pylori*. T lymphocytes reactive against *H. pylori* activate B lymphocytes within gastric mucosal lymphoid tissue; over time, monoclonal cell B-lymphocyte populations emerge and become predominant. The diagnosis is confirmed with endoscopic biopsy specimens showing dense sheets of neoplastic, marginal zone B lymphocytes. B-lymphocyte populations in MALT lymphoma remain dependent upon stimulation by T lymphocytes reactive against *H. pylori*, and therefore antibiotic eradication of *H. pylori* infection causes withdrawal of this neoplastic stimulus. The majority of patients experience a complete recovery after eradication of *H. pylori* infection. Patients with refractory disease may require radiotherapy or immunotherapy.

Incorrect Answers: B, C, D, and E.

Chemotherapy only (Choice B) or chemotherapy and radiation therapy (Choice C) are typically not required for patients with MALT lymphoma. In patients who have failed antibiotic therapy, radiotherapy or immunotherapy with rituximab are reasonable initial approaches.

External beam radiotherapy (Choice D) is the preferred treatment modality for patients who do not respond to antibiotic therapy.

Subtotal gastrectomy (Choice E) is rarely necessary for the treatment of MALT lymphoma. Most patients experience an excellent response with antibiotic therapy. In the setting of refractory disease, radiotherapy and immunotherapy are effective and less invasive therapeutic options in comparison to surgical resection.

Educational Objective: MALT lymphoma is a malignancy of B lymphocytes that originates within the marginal zone of gastrointestinal lymphoid follicles, typically within the setting of chronic infection with *H. pylori*. B-lymphocyte populations in MALT lymphoma remain dependent upon stimulation by T lymphocytes reactive against *H. pylori*, therefore, eradication of *H. pylori* infection causes withdrawal of this stimulus. Antibiotic therapy directed at the eradication of *H. pylori* is the mainstay of treatment.

29. A 27-year-old woman comes to the physician for a follow-up examination. Six months ago, she began treatment with a proton pump inhibitor for heartburn. Despite increasing the dosage to the maximum amount, her heartburn has not been relieved. She otherwise feels well and has had no weight loss. Examination today shows no abnormalities. Test of the stool for occult blood is negative. Which of the following is the most appropriate next step in management?

A) CT scan of the chest
B) Esophageal acid infusion test
C) 24-Hour esophageal pH monitoring
D) Addition of an H_2-receptor blocking agent
E) Switch to a different proton pump inhibitor

Correct Answer: C.

Gastroesophageal reflux (GERD) and associated reflux esophagitis present with burning epigastric and lower chest pain, often in association with consumption of a large meal or trigger food such as an acidic beverage, fatty foods, coffee, chocolate, or tomatoes. It is often worse with supine positioning. Acid reflux in the esophagus causes mucosal irritation and inflammation, which can present as mucosal erythema and multiple erosions (reflux esophagitis). Over time, if the GERD remains untreated, metaplasia can occur leading to Barrett esophagus, a state of pre-malignancy marked by intestinal metaplasia of the distal esophagus. Barrett esophagus may subsequently lead to the development of esophageal adenocarcinoma. Most patients with GERD may be treated empirically with proton pump inhibitors (PPIs). PPIs reduce acid secretion by irreversibly binding to the H^+/K^+ ATPase pump. They rapidly and effectively increase gastric pH and are first-line therapy for GERD and erosive esophagitis. Further evaluation is warranted in patients who do not respond to PPIs. 24-hour esophageal pH monitoring is the gold-standard for the diagnosis of GERD and may detect increased concentrations of acid in the distal esophagus in patients who have not yet manifested esophagitis that may be identified endoscopically. Patients who do not respond to PPI therapy may require surgical intervention, such as Nissen fundoplication.

Incorrect Answers: A, B, D, and E.

CT scan of the chest (Choice A) may be useful for the diagnosis of esophageal cancer staging but is not useful for the diagnosis of GERD. Esophageal cancer often presents with progressive dysphagia.

Esophageal acid infusion testing (Choice B) has been used in the past to diagnose GERD by reproducing symptoms of pain by the instillation of acidic solution into the esophagus. This method was vulnerable to a high rate of false positivity and has been rendered obsolete by esophageal pH monitoring.

Addition of an H_2-receptor blocking agent (Choice D) is unlikely to be helpful, as H_2-receptor blockers are generally less effective than PPIs.

Switching to a different proton pump inhibitor (Choice E) is unnecessary. Most PPIs have demonstrated similar efficacy and switching to a different drug is unlikely to result in significant improvement. Patients who fail PPI therapy may require surgical intervention, although the diagnosis should first be confirmed with pH monitoring.

Educational Objective: 24-hour esophageal pH monitoring is the gold-standard for the diagnosis of GERD and may detect increased concentrations of acid in the distal esophagus in patients who have not yet manifested esophagitis. Patients who do not respond to PPI therapy may require surgical intervention, such as Nissen fundoplication.

30. A 43-year-old man is brought to the emergency department by his wife because of a 1-week history of persistent fever, moderate abdominal pain, nausea, and vomiting. Medical history is unremarkable, and he takes no medications. He usually drinks at least one pint of whiskey daily but stopped 1 week ago because of his symptoms. He has had limited food intake during the past week; he has been able to keep down some water and a nutritional supplement shake that his wife convinced him to drink. The patient appears jaundiced and weak. He is 183 cm (6 ft) tall and weighs 72 kg (158 lb); BMI is 21 kg/m^2. Temperature is 38.4°C (101.1°F), pulse is 111/min, respirations are 14/min, and blood pressure is 103/66 mm Hg. Physical examination shows conjunctival icterus, thin extremities, numerous spider angiomata over the upper chest, and mild gynecomastia. Abdominal examination discloses moderate distention; no fluid wave is present. The liver edge is palpated 2 cm below the costal margin; there is marked tenderness to palpation over the liver. Muscle strength is 4/5 in the proximal aspects of all extremities. Hyperreflexia and asterixis is noted. The patient is slow to answer questions. He is oriented to person and place but not to time. Results of laboratory studies are shown:

Serum		Blood	
Alkaline phosphatase	120 U/L	Hematocrit	30%
ALT	134 U/L	Hemoglobin	10.1 g/dL
AST	277 U/L	WBC	17,200/mm^3
Bilirubin	13.4 mg/dL	Platelet count	104,000/mm^3
Calcium	7.6 mg/dL	Prothrombin time	22 seconds
Urea nitrogen	3 mg/dL	INR	1.8
Creatinine	2.2 mg/dL		
Na^+	133 mEq/L		
K^+	3.6 mEq/L		
Cl^-	97 mEq/L		
HCO_3^-	21 mEq/L		
Magnesium	1.5 mg/dL		
Phosphorus	3.0 mg/dL		
Albumin	2.3 g/dL		

Results of which of the following are most likely to be abnormal in this patient?

A) Antimitochondrial antibody test
B) Doppler ultrasonography of the abdomen
C) Hepatitis virus panel
D) Serum γ-glutamyltransferase activity
E) Urinary copper excretion

Correct Answer: D.

Alcoholic hepatitis is frequently accompanied by cholestasis, which is characterized by a disproportionate rise in bilirubin and alkaline phosphatase concentration compared to AST and ALT. In this patient, a large increase in bilirubin concentration is suggestive of cholestasis, which would be most likely to be accompanied by an increased concentration of serum γ-glutamyltransferase associated with damage to the bile duct walls. Cholestasis is accompanied by jaundice, visible at a bilirubin concentration of 2 mg/dL or greater, and pruritus. Patients with alcoholic hepatitis may also present with fever, altered mental status, asterixis, and transaminitis. Histopathology of affected hepatocytes shows Mallory bodies and ballooning degeneration. Alcoholic hepatitis and associated cirrhosis have a high rate of morbidity and mortality, which can be predicted using the Model for End-Stage Liver Disease (MELD) scoring system.

Incorrect Answers: A, B, C, and E.

Antimitochondrial antibody test (Choice A) is abnormal in primary biliary cirrhosis (PBC). PBC classically presents with jaundice, pruritus, hypercholesterolemia, increased alkaline phosphatase, and fat-soluble vitamin deficiencies.

Doppler ultrasonography of the abdomen (Choice B) may show reduced blood flow in the hepatic veins in the setting of Budd-Chiari syndrome. Budd-Chiari syndrome presents with abdominal pain, ascites, and hepatomegaly.

Hepatitis virus panel (Choice C) may be useful for the evaluation of hepatitis, but is less likely to be useful in this patient with a history of alcohol use disorder.

Urinary copper excretion (Choice E) is typically abnormal in the setting of Wilson disease, which results from impaired metabolism of copper and causes neuropsychologic impairment including parkinsonism, ataxia, dementia, or hallucinations, in addition to liver disease. This patient's history is more suggestive of alcoholic hepatitis.

Educational Objective: Alcoholic hepatitis is frequently accompanied by cholestasis, which is characterized by a disproportionate rise in bilirubin and alkaline phosphatase concentration compared to AST and ALT. In this patient, a large increase in bilirubin concentration is suggestive of cholestasis, which would be most likely accompanied by an increased concentration of serum γ-glutamyltransferase related to damage to the bile duct walls.

31. A 77-year-old woman is admitted to the hospital because of a 1-day history of nausea, vomiting, and confusion. She has hypertension, coronary artery disease, and hyperlipidemia. Her medications are atorvastatin, diltiazem, and 81-mg aspirin. She is 168 cm (5 ft 4 in) tall and weighs 50 kg (110 lb); BMI is 18 kg/m^2. Her temperature is 36.9°C (98.4°F), pulse is 92/min and regular, and blood pressure is 160/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 84%. Examination shows a jugular venous pressure of 9 cm H_2O (N=5–9). Crackles are heard over the midlung fields. On cardiac examination, a three-component friction rub is heard. There is 2+ pretibial edema. On mental status examination, she is oriented to person but not to place or time. Laboratory studies show:

Serum	
Na^+	132 mEq/L
K^+	5.2 mEq/L
Cl^-	100 mEq/L
HCO_3^-	19 mEq/L
Urea nitrogen	80 mg/dL
Creatinine	3.5 mg/dL
Urine	
Blood	3+
Protein	1+
RBC	1/hpf
WBC	0/hpf

Which of the following is the most appropriate next step in management?

A) Oral administration of captopril
B) Oral administration of prednisone
C) Intravenous administration of heparin
D) Intravenous administration of 0.9% saline
E) Intravenous administration of 3% saline
F) Hemodialysis

Correct Answer: F.

Acute kidney injury can manifest with decreased urine output, hypertension, and fluid overload in addition to metabolic derangements and electrolyte abnormalities. Volume overload can present with lower extremity edema, pulmonary edema resulting in hypoxia, and jugular venous distension. Laboratory studies typically show increased blood urea nitrogen, increased potassium, increased creatinine, and may show derangements in sodium depending on the patient's volume status. The kidney is the main site for sodium and volume regulation, and acute kidney injury can result in impaired renal excretion of sodium. Sodium balance is a main driver of fluid balance. When excretion of sodium is impaired, hypervolemia and fluid retention can result, leading to lower extremity edema and if severe, pulmonary edema as in this case. Hemodialysis is indicated when acute kidney injury causes severe acidemia, electrolyte disturbances such as hyperkalemia, volume overload, or uremia (which is likely causing this patient's nausea, vomiting, and altered mental status). This patient's severe volume overload because of acute kidney injury will likely require hemodialysis.

Incorrect Answers: A, B, C, D, and E.

Oral administration of captopril (Choice A), an ACE inhibitor, is used in the treatment of hypertension and hypertensive emergency. While hypertensive emergency can result in flash pulmonary edema, hypoxia, and crackles on auscultation of lung fields, it would be unlikely to cause total body volume overload resulting in lower extremity edema and jugular venous distention.

Prednisone (Choice B) is used to treat multiple inflammatory, atopic, infectious, and autoimmune conditions. It has no specific role in managing acute kidney injury or volume overload.

Intravenous administration of heparin (Choice C) is used to treat thrombotic states such as myocardial infarction and thromboembolic disease (eg, deep venous thrombosis and pulmonary embolism). While pulmonary embolism may also result in hypoxia, lungs are typically clear to auscultation.

Intravenous administration of 0.9% saline (Choice D) would not be therapeutic and would be harmful in a patient with acute kidney injury and volume overload.

Intravenous administration of 3% saline (Choice E) is used in the management of acute increased intracranial pressure such as in acute intracranial hemorrhage. It would cause increased fluid retention and be harmful in cases of hypervolemia.

Educational Objective: Acute kidney injury can manifest with decreased urine output, hypertension, and volume overload. Hemodialysis is indicated when acute kidney injury causes severe acidemia, electrolyte disturbances such as hyperkalemia, volume overload, or uremia.

32. A 67-year-old woman, who is receiving hospice care for emphysema, has a 3-month history of progressive urinary incontinence with laughing and coughing. She is now afraid and embarrassed to laugh. She has not had pain with urination, urinary urgency, or nocturia. Current treatment includes inhaled bronchodilators, theophylline, and oxygen supplementation. She appears older than her age. Abdominal examination shows a soft, nontender abdomen; the bladder is not palpable. Pelvic examination shows a normal-appearing vagina, nontender cervix, and a small, anteverted uterus. Which of the following is the most likely cause of this patient's incontinence?

A) Atrophic vaginitis
B) Detrusor instability
C) Major depressive disorder
D) Neurogenic bladder
E) Urethral incompetence

Correct Answer: E.

Stress incontinence is common in multiparous women and in men following prostate surgery as a result of weakness of the muscles and connective tissues of the pelvic floor. In multiparous women, this is typically secondary to pregnancy with resultant mechanical stress on the vaginal wall and pelvic floor. This weakness of the pelvic floor compromises the support of pelvic structures, including the uterus, bladder, urethra, and rectum. Increased abdominal pressure (eg, coughing, sneezing, laughing, heavy lifting) causes the vesicourethral junction to move out of its normal position, preventing sphincter closure, and resulting in the subsequent leakage of urine. It is commonly associated with urethral hypermobility, as evidenced by deviation greater than 30 degrees from the horizontal of an inserted cotton-tipped applicator with straining. Stress incontinence can also be caused by a urethrocele or cystocele, although these would present with additional findings on pelvic examination. The treatment of stress incontinence includes pelvic floor exercises and weight loss, with the potential need for pessary device placement or surgical correction if there is persistent incontinence.

Incorrect Answers: A, B, C, and D.

Atrophic vaginitis (Choice A) commonly occurs as a postmenopausal change. Hypoestrogenemia leads to atrophic vulvovaginal changes and can present with symptoms of irritation, itching, dryness, and dyspareunia. Examination shows atrophy of the labia, decreased secretions, and mucosal erythema and friability.

Detrusor instability (Choice B) results in overactive bladder and urge incontinence, which presents with the urge to void followed shortly by the leakage of urine. Oxybutynin is an antimuscarinic medication used to treat urge incontinence from an overactive bladder and detrusor instability.

Major depressive disorder (Choice C) can affect patients receiving hospice care but is unlikely the cause of her stress incontinence. Patients with major depressive disorder may experience somatic symptoms, but objective findings of incontinence following straining is more consistent with stress incontinence.

Neurogenic bladder (Choice D) can be a result of spinal cord injury resulting in urinary retention and overflow incontinence. Patients can experience overflow incontinence as intravesical hydrostatic pressure eventually overcomes internal and external urinary sphincter closing pressures.

Educational Objective: Stress incontinence presents with the leakage of urine with increased intraabdominal pressure, most commonly in multiparous women as a result of weakness of the pelvic floor muscles and the subsequent loss of proximal support of the urethra. This causes inferior displacement of the vesicourethral junction and hypermobility of the urethra with intraabdominal pressure. Treatment includes pelvic floor exercises, weight loss, pessary device placement, or surgical correction.

33. A 22-year-old primigravid woman at 22 weeks' gestation is admitted to the hospital because of a 24-hour history of increasing abdominal pain, fever, nausea, and vomiting. Pregnancy has been uncomplicated, and she notes good fetal movement. She has not had pain with urination and had a bowel movement 2 days ago. Her temperature is 38.8°C (101.8°F), pulse is 100/min, and blood pressure is 100/60 mm Hg. Physical examination shows a tense abdomen with guarding and peritoneal signs; there is diffuse tenderness, more severe on the right, at the level of the umbilicus. The fetal heart rate is 150/min with no decelerations. There are no contractions. Her hematocrit is 33%, and leukocyte count is 16,000/mm^3. Serum electrolyte concentrations are within the reference ranges, and urinalysis shows no abnormalities. Ultrasonography shows a normal gallbladder and no stones; the appendix cannot be seen. Which of the following is the most appropriate next step in management?

A) Observation only
B) CT scan of the abdomen
C) Induction of labor
D) Amniocentesis
E) Exploratory laparotomy

Correct Answer: E.

Appendicitis typically presents with right lower quadrant abdominal pain that is often periumbilical at onset, with associated nausea, anorexia, fever, leukocytosis, and tenderness to palpation in the right lower quadrant on examination. In pregnancy, as a result of the location of the enlarging uterus, the appendix may be displaced superiorly as compared to that of a nongravid patient. This displacement limits the classic history and physical examination, which rely on a right lower quadrant position of the appendix. For example, initial periumbilical pain is attributed to vague, visceral innervation of the appendix being referred to the midline; once inflammation affects the parietal peritoneum, the pain becomes well-localized to the right lower quadrant, hence, the migratory character. McBurney point, a sensitive location for tenderness on palpation, is located at one-third the distance between the inguinal ligament and the umbilicus because this is the common position of the appendix. When displaced cephalad, the parietal peritoneal inflammation may no longer occur at the McBurney point, even migrating as cephalad as the right upper quadrant, mimicking diagnoses such as cholecystitis. Diagnosis is facilitated by CT scan (though less ideal in pregnancy because of the risk of teratogenicity to the fetus), MRI, or ultrasonography, which may show appendiceal enlargement, the presence of an appendicolith, appendiceal wall thickening, or periappendiceal fluid. A patient with an acute abdomen and peritoneal signs is a surgical emergency, and the next most appropriate step is exploratory laparotomy to prevent significant maternal and fetal complications.

Incorrect Answers: A, B, C, and D.

Observation only (Choice A) would be inappropriate in a gravid patient with fever and an acute surgical abdomen and may lead to significant maternal and fetal complications if appendicitis is not addressed.

CT scan of the abdomen (Choice B) can be helpful in the diagnosis of appendicitis, but there is a risk of teratogenicity to the fetus. Furthermore, the patient clinically has an acute abdomen, warranting emergency exploratory laparotomy that should not be delayed by further diagnostic tests.

Induction of labor (Choice C) is typically done with oxytocin in post-term pregnancy, medical complications of pregnancy (eg, eclampsia, chorioamnionitis), and fetal growth restriction. It would not be appropriate in a patient who is at 22 weeks' gestation and whose abdominal pain is caused by appendicitis.

Amniocentesis (Choice D) is an invasive sampling of amniotic fluid through the abdominal wall, usually performed at 15 to 20 weeks' gestation, to evaluate for chromosomal or genetic abnormalities.

Educational Objective: Acute appendicitis may occur in gravid women and presents with variably located right sided pain based on the location of the appendix or periumbilical abdominal pain, along with nausea, anorexia, fever, leukocytosis, and tenderness to palpation. Appendicitis resulting in peritonitis is a surgical emergency that warrants exploratory laparotomy to prevent significant maternal and fetal complications.

34. A 27-year-old nulligravid woman comes to the physician because she has been unable to conceive for 2 years. She also has had pain with sexual intercourse over the past 6 months. She has been otherwise healthy. Menarche was at the age of 13 years, and menses have occurred at regular 28-day intervals. Her last menstrual period was 1 week ago. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. Abdominal examination shows right lower quadrant tenderness. Pelvic examination shows a 5-cm, tender, right adnexal mass. Laboratory studies show:

Hemoglobin	12 g/dL
Leukocyte count	9000/mm^3
Segmented neutrophils	60%
Bands	5%
Lymphocytes	30%
Monocytes	5%
Erythrocyte sedimentation rate	15 mm/h

A urine pregnancy test is negative. Ultrasonography shows a 5-cm right adnexal mass containing low-level, homogeneous, internal echos. A biopsy specimen of the mass is most likely to show which of the following?

A) Atypical ovarian epithelial cells

B) Endometrial glands and stroma

C) Luteinized granulosa cells

D) Myometrium

E) Squamous cells, cartilage, and bone

Correct Answer: B.

Endometriosis refers to the presence of endometrial tissue outside of the uterus. Ectopic endometrial tissue may occur close to the uterus, such as on the cervix, within a fallopian tube, on the broad ligament, or on an ovary. The tissue may also be distant, such as on the visceral peritoneal surface of the intestines or rectum, within the peritoneal cavity, or within the thorax. Endometrial tissue remains hormonally sensitive, and symptoms often fluctuate on a cyclic, monthly basis as the tissue progresses through the histologic phases of proliferative and secretory endometrium, then sloughs during menses. Symptoms often include chronic dysmenorrhea, dyspareunia, dyschezia, and infertility. Physical examination may include tenderness to palpation of the affected structures or visualization of an endometrial implant on the cervix or vaginal wall. Subsequent fibrosis can cause palpable nodularity of the posterior uterus and cul-de-sac along with fixation of the uterus to nearby structures making it immobile. Additionally, complex cysts can form from endometrial glands and stroma within the ovary and are referred to as endometriomas. They appear as homogenous fluid-filled cysts on ultrasound, as in this patient. The gold-standard for the diagnosis of endometriosis is a diagnostic laparoscopy, which evaluates for endometriotic implant lesions on the peritoneum.

Incorrect Answers: A, C, D, and E.

Atypical ovarian epithelial cells (Choice A) may be seen on a biopsy specimen of an ovarian tumor consistent with ovarian cancer. This malignancy more commonly presents indolently in postmenopausal patients with abdominal distension and weight loss. Additionally, ovarian carcinoma would likely show solid components or septations on ultrasonography.

Luteinized granulosa cells (Choice C) would be seen on biopsy of a granulosa cell tumor, a subtype of ovarian sex cord-stromal tumor. They present nonspecifically with abdominal or pelvic pain and an adnexal mass, as well as abnormal uterine bleeding or signs of hyperandrogenism caused by the excess release of estrogen from the granulosa cells. These tumors are associated with solid components and septations on ultrasonography.

Myometrium (Choice D) may be seen on the biopsy specimen of a uterine leiomyoma or leiomyosarcoma. However, these masses are commonly solid on ultrasonography, rather than cystic as seen in this patient.

Squamous cells, cartilage, and bone (Choice E) would be seen on the biopsy specimen of a mature cystic teratoma or dermoid cyst, which is a common benign ovarian tumor that contains cell types from all three embryologic layers. It presents with symptoms of abdominal fullness or pelvic pain. However, it is associated with solid components on ultrasonography.

Educational Objective: Endometriosis refers to the implantation of ectopic endometrial glands and stroma outside of the uterus. Symptoms commonly include chronic dysmenorrhea, dyspareunia, dyschezia, and infertility. Endometriomas are complex cysts that can form in an affected ovary and appear as homogenous cystic structures on ultrasonography.

35. A 52-year-old woman comes to the physician because of a 1-week history of swelling of the ball of her right foot. She remembers that she saw a small area of blood on the floor after she rose to take a break from sewing. She was not wearing shoes at the time. When she looked, she did not see anything on her feet. She has type 2 diabetes mellitus, retinopathy, and hypertension. She does not measure her blood glucose concentration regularly; her last hemoglobin A_{1c} 4 weeks ago was 10%. Her medications are metformin, glyburide, and hydrochlorothiazide. She is 157 cm (5 ft 2 in) tall and weighs 109 kg (240 lb); BMI is 44 kg/m^2. Her temperature is 37.8°C (100°F), and blood pressure is 145/85 mm Hg. Examination shows a 2-mm, superficial wound over the plantar aspect of the right foot between the second and third metatarsophalangeal joints. There is edema and tenderness to palpation over the right forefoot, particularly over the third metatarsophalangeal joint. Dorsalis pedis pulses are not palpable bilaterally. Semmes-Weinstein 5.07 monofilament testing shows decreased sensation over both feet. An x-ray of the right foot is shown. Which of the following is most likely to have prevented this patient's current condition?

A) Daily foot checks performed by the patient

B) Regular measurement of blood glucose concentrations

C) Twice daily application of skin moisturizer to the feet

D) Use of orthotic inserts

E) Wearing shoes when standing or walking

Correct Answer: E.

Long-standing and/or poorly controlled diabetes mellitus can lead to the development of diabetic neuropathy. Chronic hyperglycemia leads to glycosylation of axon proteins along with sorbitol-related osmotic damage to the neuron, which causes progressive sensory and motor neuropathy. Early, the condition mostly affects distal nerves, that is, the small distal nerves of the feet and fingers. Over time, the neuropathy progresses proximally, leading to pain and decreased sensation in the extremities. Diabetic neuropathy both impairs the healing response of the distal extremities and reduces the patient's awareness of injuries to the extremities, thereby creating the conditions that underlie the increased incidence of foot trauma in patients with diabetes mellitus. Screening for neuropathy is performed yearly using a monofilament test. This patient's poorly controlled diabetes mellitus and diabetic neuropathy likely led to a foreign body injury that remained unnoticed. To prevent injuries that may be unnoticed, patients with diabetic neuropathy should wear protective shoes when moving about.

Incorrect Answers: A, B, C, and D.

Daily foot checks performed by the patient (Choice A) would help the patient identify injuries that are sustained but would not help prevent the injuries from occurring.

Regular measurement of blood glucose concentrations (Choice B) is one part of the management of diabetes that may help glycemic control and prevent further complications of diabetes. However, diabetic neuropathy is irreversible, and this patient's severe neuropathy is unable to be further prevented by measurement of blood glucose concentrations. The rate of progression may slow with improved glycemic control, though.

Twice daily application of skin moisturizer to the feet (Choice C) would not be helpful in the management of diabetic neuropathy and would not have prevented this patient's foreign body injury.

Use of orthotic inserts (Choice D) can help with foot pain and lower back pain with walking and standing but is not helpful in the management of diabetic neuropathy.

Educational Objective: Diabetic neuropathy both impairs the healing response of the distal extremities and reduces the patient's awareness of injuries to the extremities, thereby creating the conditions that underlie the increased incidence of foot trauma in patients with diabetes mellitus. To prevent injuries that may be unnoticed, patients with diabetic neuropathy should wear protective shoes when moving about.

36. A 13-year-old boy is brought to the office by his parents for a well-child examination. He is at the 10th percentile for height and 97th percentile for weight. The physician has counseled the patient about diet and exercise in the past, but his parents state that he has not changed his eating patterns. The parents add that he has become less involved in school activities, his grades are declining, and he is being bullied at school about his weight. Which of the following is the most appropriate next step in management?

A) Begin cognitive behavioral therapy to change the patient's eating habits

B) Give the patient more specific information and resources about a healthy diet and exercise program

C) Involve the patient's parents in the treatment of his obesity and schedule regular follow-up appointments

D) Prescribe metformin therapy to aid in weight loss

E) Prescribe sertraline therapy and ask the parents to monitor the patient for suicidal behavior

Correct Answer: C.

Childhood obesity is a major public health problem related to a combination of genetic, lifestyle, and systemic factors (eg, income inequality leading to decreased access to healthy foods). The initial management involves non-pharmacologic strategies such as a balanced diet and regular exercise. Adherence to a healthy diet is challenging for adolescents for several individual-level and systems-level reasons. Individual-level barriers to healthy eating include eating to cope with feelings, low motivation, and low self-esteem. Systems-level barriers include low socioeconomic status and cultural/family eating patterns. Parents can assist adolescents with adhering to a healthy diet by encouraging healthy eating habits and limiting the availability of unhealthy foods. Regular physician follow-up is warranted to continue addressing barriers to adherence and to perform motivational interviewing to improve the child's motivation to adhere to behavior changes.

Incorrect Answers: A, B, D, and E.

Beginning cognitive behavioral therapy (CBT) to change the patient's eating habits (Choice A) may be appropriate if involving the parents and establishing regular follow-up fails to improve the patient's eating habits. Given the limited availability of intensive psychotherapies such as CBT and the effectiveness of parent-level interventions, the primary care physician should attempt to intervene first.

Giving the patient more specific information and resources about a healthy diet and exercise program (Choice B) would be less likely to lead to behavior change than enlisting the parents' collaboration to promote healthy eating at home. Providing more information would not effectively address common individual- or systems-level barriers to adherence in adolescents.

Prescribing metformin therapy to aid in weight loss (Choice D) may be trialed if non-pharmacologic strategies fail. Metformin therapy has been associated with modest weight loss in obese adolescents and adults.

Prescribing sertraline therapy (Choice E) would be unnecessary in this child, who does not meet major depressive disorder (MDD) criteria (eg, does not endorse a depressed mood or significant neurovegetative symptoms such as decreased energy, appetite disturbances, or sleep disturbances). Nevertheless, the physician should monitor for the development of MDD in this child who has begun losing motivation for school activities.

Educational Objective: Obese adolescents commonly encounter barriers to adherence to a healthy diet. In adolescents unable to change their eating behavior, involving the parents to promote healthy eating habits at home is commonly beneficial. Regular physician follow-up to continue addressing adherence barriers is also indicated.

37. Three years after a state passed legislation eliminating mandatory helmet use for motorcycle riders, an investigator is studying the incidence of head injuries in motorcycle riders involved in motor vehicle collisions. The state's motor vehicle department data during the past 3 years are analyzed. Results show that motorcycle riders between the ages of 18 and 25 years who did not wear a helmet were more likely to die during a collision; the same age group also had an increased morbidity rate from nonlethal head traumas. Which of the following is the most appropriate outcome measure to determine the overall public health impact of eliminating mandatory helmet use in motorcycle riders in the state?

A) Age-specific death rate
B) Crude mortality
C) Disability-adjusted life years (DALY)
D) Standardized mortality ratio
E) Years of potential life lost (YPLL)

Correct Answer: C.

Disability-adjusted life years (DALY) is the most appropriate outcome measure for the investigator to report as part of this study. The increased likelihood of morbidity and mortality are the key outcomes of this study and the optimal outcome measure will portray both datapoints. DALY is a metric of overall disease burden, which takes into account not only the years of life lost because of death but also the years of healthy life lost as a result of disability, thus incorporating morbidity and mortality into one metric.

Incorrect Answers: A, B, D, and E.

Age-specific death rate (Choice A) is the death rate of a specific age group. Crude mortality (Choice B) rate is calculated as the total number of deaths in a given population, in this case, motorcycle riders who did not wear helmets, divided by the total population. Standardized mortality ratio (Choice D) is the ratio of observed deaths to expected deaths within a population. None of these statistics convey the additional burden of nonlethal motor vehicle collisions and their accompanying morbidity. Mortality rates alone may underestimate the degree of burden created by motor vehicle collisions involving motorcyclists not wearing helmets, therefore a metric that takes into account morbidity as well as mortality is more appropriate.

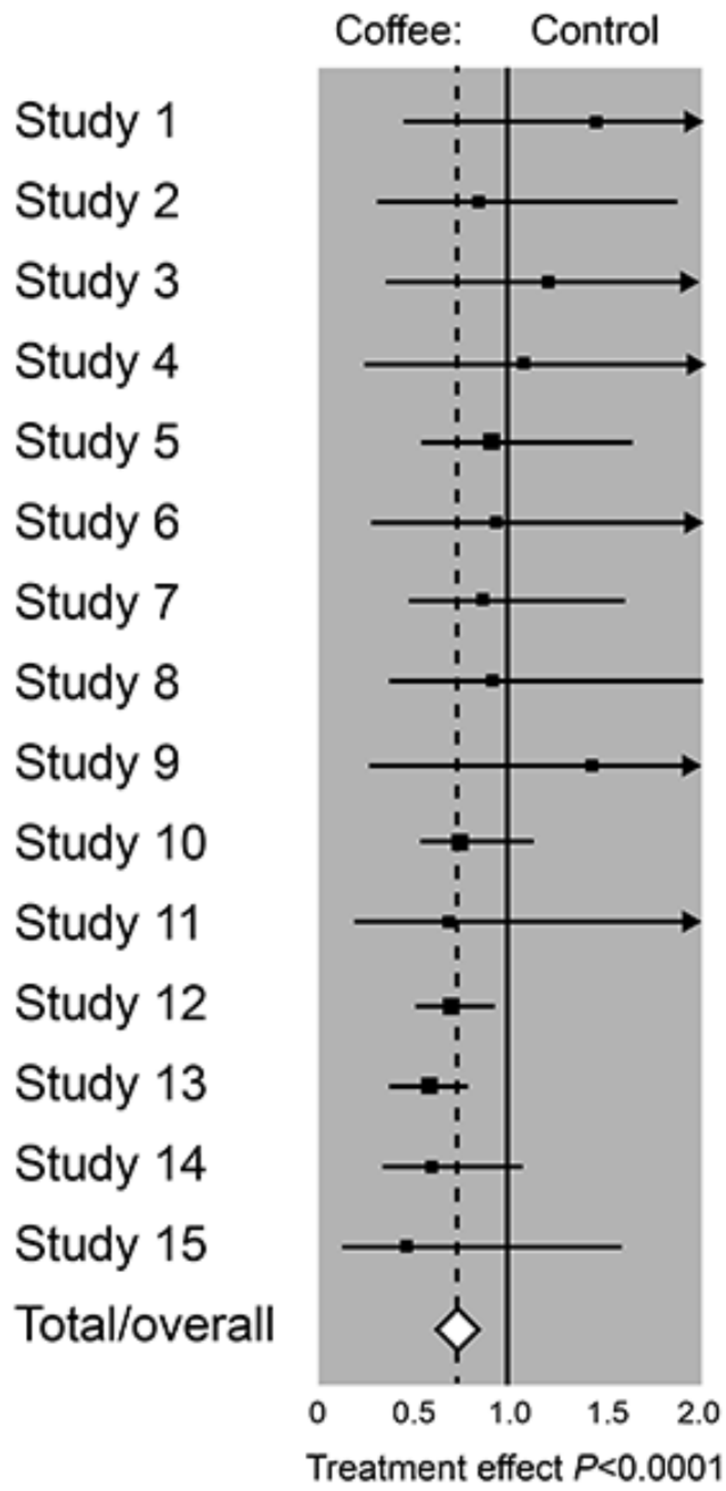
Years of potential life lost (YPLL) (Choice E) would take into account the increased mortality rate that accompanied the change in legislation but not the impact of increased morbidity in nonlethal traumas. Thus, DALY is a more appropriate outcome measure to use in this case.

Educational Objective: DALY is a metric of overall disease burden that takes into account not only the years of life lost caused by death but also the years of healthy life lost as a result of disability. It incorporates morbidity and mortality into one metric.

38. A series of small studies are conducted during a 12-year period comparing daily consumption of one to three cups of coffee with the 5-year development of endometrial cancer; these studies yield mixed or nonsignificant results. A subsequent meta-analysis of 15 of these studies is conducted. Each study met prespecified criteria. The results are shown. Which of the following is the most appropriate interpretation of the meta-analysis of coffee consumption and the risk for endometrial cancer?

	Risk for Endometrial Cancer	Statistical Significance
A)	Decreased	not significant
B)	Decreased	significant
C)	Increased	not significant
D)	Increased	significant

Risk of Endometrial Cancer (95% CI)



Correct Answer: B.

The most appropriate interpretation of this systemic meta-analysis is that the risk of endometrial cancer is significantly decreased with daily consumption of one to three cups of coffee. A forest plot is a figure typically used in meta-analyses to demonstrate each individual study's findings alongside a summary estimate. The summary estimate, typically located at the bottom of the forest plot, conveys the overall finding of the meta-analysis. For individual studies, each black box indicates the odds ratio or relative risk of endometrial cancer in the group consuming one to three cups of coffee. The horizontal line indicates the confidence interval. In this case, when taken individually, all studies except Study 12 and Study 13 have a confidence interval that crosses 1.0, indicating that the finding was not significant. Study 12 and Study 13 demonstrate a decreased risk of endometrial cancer development with coffee consumption and their confidence intervals do not cross 1.0, indicating significance. The summary estimate combines the results of all studies, taking into account the sample size of each. In this case, the summary estimate indicates the overall risk of endometrial cancer development in the coffee drinkers as being less than 1.0, a protective effect. Rather than indicating the confidence interval, the significance of the summary estimate is conveyed by the *p* value underneath the figure. Because the p value in this case is <0.05, the findings are considered statistically significant.

Incorrect Answers: A, C, and D.

The findings of the systemic meta-analysis are significant rather than not significant (Choices A and C) because of the *p* value shown at the bottom of the figure being <0.05, which is typically set as the cut-off point of significance.

The risk of developing endometrial cancer is decreased, not increased (Choices C and D) because the overall relative risk is less than 1.0. A relative risk greater than 1.0 would convey an increased risk of developing endometrial cancer with daily coffee consumption.

Educational Objective: A forest plot is used to convey the results of a meta-analysis. The overall risk is found by combining data from all individual studies and a *p* value is reported to indicate significance.

39. A new blood test to diagnose temporal arteritis is being evaluated using 100 patients with biopsy-proven temporal arteritis and 100 participants who do not have this disease. The blood test is found to have a sensitivity of 75% and specificity of 25%. Which of the following are the positive and negative predictive values of this test?

	Positive Predictive Value	Negative Predictive Value
A)	25	50
B)	25	75
C)	50	50
D)	50	75
E)	75	25
F)	75	75

Correct Answer: C.

The positive predictive value (PPV) and negative predictive values (NPV) of this test are 50 and 50. PPV and NPV are statistical measures that define the proportion of positive test results that are true positives and negative test results that are true negatives, respectively. PPV is defined as (true positives (TP)) / (TP + false positives (FP)) and measures the probability of a patient actually having the disease given a positive test result. NPV is defined as (true negatives (TN)) / (TN + false negatives (FN)) and measures the probability of a patient being disease free given a negative test result. In this case, the sample size, sensitivity, and specificity are given. Based on those values, the number of true positives, false positives, true negatives, and false negatives can be calculated. With those values, PPV and NPV must be calculated. Because the sensitivity is 75% and there are 100 participants with the disease, the number of true positives is 75 and number of false negatives is 25. Because the specificity is 25% and there are 100 participants without the disease, the number of true negatives is 25 and the number of false positives is 75. Thus, the PPV is equal to 75 / (75 + 75) = 0.5 or 50% and the NPV is equal to 25 / (25 + 25) = 0.5 or 50%.

Incorrect Answers: A, B, D, E, and F.

The positive predictive value is 50%, not 25% (Choices A and B). 25% is the specificity of the test. Specificity can be calculated using the following equation: specificity = TN / (TN + FP).

Along with the PPV, the NPV in this case is 50%, not 75% (Choice D).

The sensitivity, not the positive predictive value, of the test is 75% (Choices E and F). Sensitivity is calculated using the following equation: sensitivity = TP / (TP + FN).

Educational Objective: PPV defines the proportion of positive test results that are true positive, and is calculated as TP/(TP + FP). NPV defines the proportion of negative test results that are true negative, and is calculated as TN/(TN + FN).

40. An 8-year-old boy is brought to the emergency department because of blood in his urine for 24 hours. His older brother and maternal uncle have a chronic bleeding disorder characterized by recurrent hemarthroses and soft-tissue bleeding. Examination shows no abnormalities. Laboratory studies show:

Hematocrit	32%
Leukocyte count	8000/mm^3
Segmented neutrophils	68%
Lymphocytes	32%
Platelet count	225,000/mm^3
Bleeding time	5 min
Prothrombin time	12 sec (INR=1)
Partial thromboplastin time	50 sec
Plasma fibrinogen	250 mg/dL (N=200–400)

Which of the following is the most likely cause of this patient's prolonged bleeding?

A) Factor V deficiency
B) Factor VII deficiency
C) Factor VIII deficiency
D) Factor XII deficiency
E) Presence of a thromboplastin inhibitor
F) von Willebrand disease

Correct Answer: C.

Factor VIII deficiency, also known as hemophilia A, most likely accounts for this patient's increased partial thromboplastin time (PTT) with normal prothrombin time (PT), platelets, and fibrinogen. Hemophilia A is an X-linked coagulopathy that arises as a result of a genetic deficiency in factor VIII synthesis or activity. Patients often present with easy bruising and hemorrhage involving muscles and joints. Hemorrhage can be life-threatening, often requiring transfusions of factor VIII to replace the deficient protein. Patients can acquire antibodies against exogenous factor VIII, which can necessitate larger transfusions to elicit the same hemostatic effect. As the PTT measures the activity of the intrinsic clotting cascade, which include factor VIII, a deficiency of factor VIII leads to a prolonged PTT. However, the PT is normal as it measures the activity of the extrinsic clotting cascade, which remains intact in patients with hemophilia A. There is no effect on the level or activity of platelets.

Incorrect Answers: A, B, D, E, and F.

Factor V (proaccelerin) deficiency (Choice A) is a rare inherited bleeding disorder that may present with mucocutaneous bleeding or major bleeding following trauma or surgery. Factor V is required as a cofactor for the formation of thrombin in the common pathway of the coagulation cascade. Deficiency is treated with fresh frozen plasma (FFP), which contains factor V.

Factor VII (proconvertin) deficiency (Choice B) is a rare bleeding disorder with a spectrum of clinical severity. Patients who are most affected present with heavy menstrual bleeding or bleeding following invasive procedures. Treatment is with factor replacement, prothrombin complex concentrate, or FFP.

Factor XII deficiency (Choice D) is a rare autosomal recessive condition that may actually predispose to thromboembolism, not bleeding. This is thought to result from decreased fibrinolysis though studies are mixed.

Presence of a thromboplastin inhibitor (Choice E) is incorrect. Thromboplastin is inhibited by apoB-100. The tissue thromboplastin inhibition test used to be a method of detecting the presence of lupus anticoagulant, but this is no longer routinely used.

Von Willebrand disease (Choice F) is a common inherited cause of mucocutaneous bleeding and results from a deficiency in von Willebrand factor (vWF) levels or function. It is reflected by increased bleeding time, decreased factor VIII activity, and suppressed ristocetin cofactor activity. Treatment depends on the site and severity of bleeding and may include desmopressin or vWF concentrates.

Educational Objective: Hemophilia A results from a genetically inherited deficiency in factor VIII levels or activity. Patients present with easy bruising and hemorrhage into muscle and joints. Laboratory studies show an increased PTT, but a normal PT. Treatment is with recombinant factor VIII.

41. A 37-year-old woman comes to the physician for a routine health maintenance examination. She has no history of abnormal Pap smears or sexually transmitted diseases. Her only medication is an oral contraceptive. Pelvic examination shows no abnormalities. Results of a Pap smear show atypical glandular cells. Which of the following is the most appropriate next step in management?

A) Repeat Pap smear in 6 months
B) Hysteroscopy
C) Cone biopsy of the cervix
D) Colposcopy with endocervical curettage
E) Hysterectomy

Correct Answer: D.

Atypical glandular cells shown on cytologic study of cells collected from the cervix (also known as Pap smear) should be further evaluated by colposcopy with endocervical curettage. Cytologic study of cells collected from the cervix is recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. Abnormal results of cytologic study of cells collected from the cervix are most commonly evaluated by colposcopy, which allows for the visual assessment and biopsy of abnormal lesions. Endocervical curettage allows sampling of the endometrial canal and is also necessary in patients with atypical glandular cells, as they can be indicative of cervical or endometrial malignancy. Endometrial biopsy is also commonly recommended in patients with this abnormality, particularly in those older than 35 years of age or with risk factors for endometrial neoplasia.

Incorrect Answers: A, B, C, and E.

Repeat Pap smear in 6 months (Choice A) is not routinely recommended following abnormal cytologic study of cells collected from the cervix. Prolonging a more thorough evaluation with colposcopy and endocervical curettage would risk this patient having a cancer that remains undetected, which would lead to increased morbidity and mortality.

Hysteroscopy (Choice B) is the evaluation of the uterine cavity via a camera inserted into the cervical canal. It allows for structural evaluation of the cavity and visualization of polyps, fibroids, and other structural abnormalities. While it would allow for sampling of the endometrium, this patient should first be evaluated with colposcopy and endocervical curettage to evaluate for a cervical or endometrial malignancy.

Cone biopsy of the cervix (Choice C) is recommended when there is evidence of cervical intraepithelial neoplasia (CIN) on a cytologic study of cells collected from the cervix. It allows evaluation of a larger region of the cervix for cervical carcinoma and may be curative in the setting of CIN if a margin of normal cervical tissue is identified on histology.

Hysterectomy (Choice E) is recommended for advanced cervical cancer, uterine cancer, and ovarian cancer. This patient may have one of these underlying malignancies but should first be evaluated with colposcopy and endocervical curettage prior to advancing to a more definitive surgical treatment.

Educational Objective: Cytologic study of cells collected from the cervix is used to screen for cervical cancer. Abnormal cytology results are commonly evaluated by colposcopy. However, if these results include atypical glandular cells, evaluation should also include endocervical curettage to evaluate for endometrial cancer.

42. A 4000-g (8-lb 13-oz) newborn has respiratory distress immediately after emergency cesarean delivery because of a prolapsed umbilical cord. He was born at term to a 24-year-old primigravid woman whose pregnancy was complicated by gestational diabetes. The newborn's temperature is 36.7°C (98°F), pulse is 180/min, respirations are 60/min, and blood pressure is 60/40 mm Hg. Examination shows ecchymoses over the face and upper chest. There are mild subcostal and intercostal retractions. The remainder of the examination shows no abnormalities. An x-ray of the chest shows a left pleural effusion. A chest tube is inserted, and fluid is obtained; analysis shows clear fluid with numerous lymphocytes. Three days later, the newborn is breast-feeding without difficulty. Drainage from the chest tube is now milky. Which of the following is the most likely cause?

A) Bronchogenic cyst
B) Chylothorax
C) Pleural effusion with secondary infection
D) Pneumonia with sympathetic effusion
E) Traumatic pleural effusion

Correct Answer: B.

Chylothorax is caused by an injury to the thoracic duct, which allows chyle to accumulate in the pleural space. The thoracic duct empties into the central vasculature at the junction of the left subclavian and internal jugular veins, thus damage to the duct causes a left-sided pleural effusion. Chyle consists of triglycerides that are being carried from the intestine to the bloodstream, which gives it a milky appearance. However, prior to enteral nutrition, chyle will be straw-colored, as in this patient. In newborns, a chylothorax can be caused by a congenital malformation of the lymphatic system or by trauma caused during delivery or during a procedural intervention. When congenital, it can be associated with hydrops fetalis, Down syndrome, Turner syndrome, and Noonan syndrome. Symptoms include respiratory distress and, occasionally, fever as a result of an inflammatory response. Chest x-ray will most commonly show a left-sided pleural effusion, and treatment includes placement of a chest tube, supportive therapy such as oxygen supplementation, and surgical correction of the defect.

Incorrect Answers: A, C, D, and E.

Bronchogenic cyst (Choice A) presents with chronic cough, wheezing, and recurrent infections, usually in childhood. It is caused by an abnormal outpouching of the foregut during embryonic development. In newborns, if large or rapidly expanding, they can cause respiratory distress. However, symptoms would not be improved with chest tube placement; rather, they require surgical excision.

Pleural effusion with secondary infection (Choice C) occurs when a pleural effusion becomes seeded with bacteria or another infectious organism. The appearance of the effusion is often purulent, rather than milky as seen in this patient, and is often associated with systemic symptoms such as a fever.

Pneumonia with sympathetic effusion (Choice D) presents with fever, cough, shortness of breath, and pleuritic chest pain. The effusion is often exudative, with predominant neutrophils, and increased protein and l-lactate dehydrogenase concentrations. A pneumonia complicated by a parapneumonic effusion would be unlikely in a newborn immediately following delivery.

Traumatic pleural effusion (Choice E) often refers to a hemothorax, in which blood accumulates in the pleural space as a result of trauma to the lung parenchyma or chest wall. In the case of a hemothorax, the fluid removed by a chest tube would be bloody rather than milky.

Educational Objective: Chylothorax occurs as a result damage to the thoracic duct, which allows chyle to accumulate in the pleural space. This causes respiratory distress and, occasionally, inflammatory signs such as a fever. In newborns, this fluid will be clear prior to initiating feeds but will turn milky in appearance following breast-feeding, as the thoracic duct carries triglycerides from the gastrointestinal system to the central vasculature.

43. A 32-year-old woman comes to the physician because of a 1-month history of diarrhea, abdominal bloating, and loss of appetite resulting in a 3.6-kg (8-lb) weight loss. She reports three to four semiliquid stools daily. She has not had fever, abdominal pain, or rectal bleeding. She returned from a scuba diving vacation in Mexico 6 weeks ago; her boyfriend who accompanied her has not had similar symptoms. Abdominal and rectal examinations show no abnormalities. Which of the following is the most likely causal organism?

A) *Escherichia coli* O157:H7
B) *Giardia lamblia*
C) Rotavirus
D) *Vibrio cholerae*
E) *Yersinia enterocolitica*

Correct Answer: B.

This patient's history of chronic diarrhea, bloating, and weight loss that began shortly after travel abroad is consistent with giardiasis. Giardiasis is caused by *G. lamblia*, a flagellated, parasitic organism that is usually acquired through the ingestion of cysts in contaminated water, which then mature into trophozoites in the small bowel. Parasitic overgrowth of the small bowel leads to intestinal malabsorption. Giardiasis presents with persistent diarrhea that is foul-smelling and fatty, as well as abdominal pain, bloating, cramping, and weight loss. In contrast to bacterial gastroenteritis, which is typically self-limited over a period of 1 to 2 weeks, untreated giardiasis will manifest a chronic course that may last between 2 and 4 weeks. A minority of patients may develop chronic infection that lasts for several months. *G. lamblia* displays an incubation period of up to 2 weeks after exposure, and it is common for patients to manifest symptoms after returning home from travel abroad. Diagnosis is made with stool culture, microscopy, or stool antigen testing. First-line treatment is with oral metronidazole or tinidazole. Patients should be counseled as to the importance of hand hygiene and avoidance of untreated water while traveling.

Incorrect Answers: A, C, D, and E.

Escherichia coli O157:H7 (Choice A) is associated with enterohemorrhagic gastroenteritis and is also associated with hemolytic uremic syndrome caused by its production of Shiga-like toxin. It is typically acquired by ingestion of poorly cooked meat or vegetables.

Rotavirus (Choice C) is a double-stranded RNA virus that causes infectious diarrhea in children. The diarrhea caused by rotavirus is watery, profuse, and often foul-smelling. It is not commonly acquired during international travel.

Vibrio cholerae (Choice D) is the agent responsible for cholera, which presents with severe, acute watery diarrhea and dehydration. It is endemic to Africa, southeast Asia, Haiti, and India. Cholera is rare in travelers, even within endemic areas.

Yersinia enterocolitica (Choice E) is a Gram-negative rod that causes bloody diarrhea and abdominal pain. It results from eating contaminated food or water. It is less likely as a cause of traveler's diarrhea than *G. lamblia*.

Educational Objective: Giardiasis presents with persistent diarrhea that is foul-smelling and fatty, as well as abdominal pain, bloating, cramping, and weight loss. As a result of the latency period of *G. lamblia*, symptoms may begin after returning from travel abroad and may last for up to 1 month, in contrast to the more limited duration of bacterial gastroenteritis.

44. A male newborn is cyanotic immediately after delivery. He was born at term to a healthy 27-year-old woman, gravida 3, para 2, after an uncomplicated pregnancy and vaginal delivery. Examination shows no respiratory effort and poor muscle tone. His pulse is 60/min. Positive pressure ventilation and aggressive stimulation are begun. Examination 5 minutes later shows active movement of the extremities, grimacing in response to pain, acrocyanosis, and a strong cry. His pulse is now 120/min. Which of the following is the most appropriate next step in management?

- A) Observation only
- B) Measurement of serum hemoglobin concentration
- C) Echocardiography
- D) Intravenous administration of 10% dextrose in water
- E) Continued positive pressure ventilation
- F) Intubation

Correct Answer: A.

A newborn must transition from receiving oxygen through placental blood to breathing on their own. Changes in the cardiorespiratory system occur immediately following birth that make this transition possible, including replacing alveolar fluid with air and increasing pulmonary blood flow. These changes increase arterial oxygen saturation and improve a newborn's respiratory drive, leading to a regular breathing pattern. Respiratory distress is common, however, and a substantial portion of newborns require assistance with the initiation of breathing. Initial, universal steps after delivery include an assessment of the newborn's heart and respiratory rates, muscle tone, reflexes, and color, and immediate warming, drying, and tactile stimulation, all of which are helpful for stimulating spontaneous respirations. Newborns who fail to respond to tactile stimulation should be immediately supported with more aggressive techniques, such as bag-valve-mask ventilation. If resuscitative efforts with tactile stimulation or positive pressure ventilation lead to a pulse greater than or equal to 100/min and improved respiratory efforts, the newborn can be closely observed without further intervention. Failure to improve or a pulse that falls below 60/min warrants endotracheal intubation, with chest compressions for those experiencing the latter per the Pediatric Advanced Life Support algorithm.

Incorrect Answers: B, C, D, E, and F.

Measurement of serum hemoglobin concentration (Choice B) may be warranted if there is concern for significant blood loss during delivery or hemolytic disease of the newborn. Anemia can present with hypotension and unresponsiveness, as well as jaundice, ascites, pleural and pericardial effusions, and peripheral edema. This patient improved with stimulation and positive pressure ventilation, making anemia a less likely cause of unresponsiveness.

Echocardiography (Choice C) can be used to evaluate for structural defects in the newborn heart. Congenital heart diseases can lead to respiratory distress, cyanosis, and hypoxia. However, these patients often fail to improve with supplemental oxygen.

Intravenous administration of 10% dextrose in water (Choice D) can be used to treat hypoglycemia. This can be caused by maternal diabetes mellitus, fetal growth restriction, prematurity, disorders of glycogenolysis or gluconeogenesis, and liver disease. Symptoms include jitteriness, diaphoresis, irritability, lethargy, poor muscle tone, seizures, and poor feeding.

Continued positive pressure ventilation (Choice E) is no longer required, as this patient's resuscitative efforts have improved his heart rate and respiratory status.

Intubation (Choice F) is not necessary. Endotracheal intubation is recommended if a newborn's pulse and respiratory status fail to improve with stimulation and positive pressure ventilation or if the pulse remains below 60/min. Since this patient has improved with initial resuscitative efforts, he can be observed carefully for decompensation.

Educational Objective: Respiratory distress in newborns is common following delivery because of physiologic changes that must occur in order for the newborn to transition from placental blood oxygenation to breathing on their own. Initial resuscitative efforts include stimulation along with positive pressure ventilation for infants that are apneic or have a pulse less than 100/min. If the pulse and respiratory status improve, the patient can be observed without further intervention; however, if they fail to improve, endotracheal intubation should occur with chest compressions for those whose pulse remains below 60/min.

45. A 37-year-old premenopausal woman undergoes a modified radical mastectomy with transverse rectus abdominis musculocutaneous (TRAM) flap reconstruction for a 4-cm infiltrating ductal carcinoma in the upper outer quadrant of the right breast. The axillary dissection yields two positive lymph nodes of 22 that were removed. The tumor is progesterone-receptor positive with a low S phase. Which of the following factors is most predictive of this patient's survival?

A) Age
B) Lymph node involvement
C) Progesterone-receptor status
D) S-phase concentration
E) Tumor size

Correct Answer: B.

Breast cancer is the most common non-dermatologic malignancy in women, and commonly presents with a breast mass, skin or nipple retraction, or axillary lymphadenopathy. However, it may be asymptomatic and diagnosed via screening. Risk factors for breast cancer development include exogenous estrogen administration, a family history of premenopausal breast cancer, genetic mutations (eg, *BRCA1* and *BRCA2*), early menarche, late menopause, nulliparity, obesity, and African American ethnicity. The most common type is invasive ductal carcinoma, which typically presents as a palpable, immobile breast mass, which may demonstrate features such as spiculated margins and microcalcifications on mammography. Negative prognostic factors include age with both young and elderly patients having higher mortality, African American race, higher tumor stage (including nodal involvement and tumor size) or histologic grade, and HER2 gene expression, whereas estrogen-receptor and progesterone-receptor expression are associated with improved outcomes. Of these, tumor stage is the most important prognostic factor, with spread to regional lymph nodes predicting a worse survival. Increased tumor size is also associated with greater mortality, but to a lesser extent than lymph node involvement.

Incorrect Answers: A, C, D, and E.

Age (Choice A), progesterone-receptor status (Choice C), and tumor size (Choice E) are all important prognostic factors in the evaluation of breast cancer. However, they are less indicative of survival than lymph node involvement (which indicates a higher stage) at diagnosis.

S-phase concentration (Choice D) is a key component of the histologic analysis of tumor grade. Low S-phase concentration is associated with a lower tumor grade. However, tumor grade is less indicative of survival than lymph node involvement.

Educational Objective: Breast cancer is the most common non-dermatologic malignancy in women. Prognostic factors include age, race, tumor stage and grade, and hormone receptor status. Of these, tumor stage is the most indicative of survival with metastases to regional lymph nodes and distant sites predictive of increased mortality.

46. An 87-year-old man comes to the physician because of a 1-year history of difficulty starting his urinary stream and occasional postvoid dribbling. He typically arises to void two times nightly. He has a 30-year history of type 2 diabetes mellitus complicated by orthostatic hypotension secondary to autonomic dysfunction. Current medications include lisinopril and glyburide. His blood pressure is 140/80 mm Hg while supine and 100/60 mm Hg while standing. Examination shows an enlarged prostrate. Which of the following is the most appropriate pharmacotherapy for this patient's urinary symptoms?

A) Amlodipine
B) Doxazosin
C) Finasteride
D) Metoprolol
E) Oxybutynin

Correct Answer: C.

Benign prostatic hypertrophy (BPH) affects middle-aged and elderly male patients and occurs as a result of the excess growth of tissue in the central zone of the prostate causing lower urinary tract obstruction. BPH presents with urinary dribbling and incontinence, difficulty starting or maintaining a urinary stream, nocturia, the need to frequently urinate, and incomplete voiding. These symptoms are typically insidious in onset, chronic, and progressive. Chronic outlet obstruction often leads to urinary retention and increases the risk for urinary tract infection. The diagnosis of BPH is made by history, physical examination, and urodynamic testing, along with ruling out alternate diagnoses (eg, prostatic malignancy). Treatment is with supportive care, α_1-adrenergic blockers (eg, tamsulosin or doxazosin), 5-α-reductase inhibitors (eg, finasteride), or surgery. While α-adrenergic blockers are commonly used, they can cause or worsen orthostatic hypotension and would be an inappropriate choice for this patient. Therefore, finasteride would be a more appropriate pharmacotherapy for treating this patient's symptoms.

Incorrect Answers: A, B, D, and E.

Amlodipine (Choice A) is a dihydropyridine calcium channel blocker used to treat hypertension. It is not used to treat BPH and would worsen this patient's orthostatic hypotension.

Doxazosin (Choice B) is an α_1-adrenergic receptor antagonist used in the treatment of BPH. However, as α_1-receptors are also present in the blood vessels, doxazosin can cause or worsen orthostatic hypotension and would be inappropriate in this patient.

Metoprolol (Choice D) is a nonselective β-adrenergic blocker used in the treatment of chronic heart failure and tachyarrhythmias, such as atrial fibrillation or atrial flutter. It is not used in the treatment of BPH and would worsen this patient's orthostatic hypotension.

Oxybutynin (Choice E) causes smooth muscle relaxation in the bladder and is used for the treatment of overactive bladder or urge incontinence. This patient's symptoms of difficulty starting his urine stream, postvoid dribbling, and nocturia are more consistent with BPH rather than an overactive bladder.

Educational Objective: BPH is a common condition in older males caused by proliferation of the central zone of the prostate, which leads to urinary outlet obstruction. Symptoms include difficulty starting urination, a weak urinary stream, nocturia, and incomplete voiding. Medical treatment includes α_1-adrenergic blockers (eg, tamsulosin or doxazosin) and 5-α-reductase inhibitors (eg, finasteride). However, care should be given in prescribing α_1-adrenergic blockers as they can cause or worsen orthostatic hypotension.

47. An asymptomatic 37-year-old woman comes to the physician for a follow-up examination. She has a 19-year history of hypertension that has been difficult to control with medication. She has measured her blood pressure at home every morning for the past 3 weeks; readings have ranged between 148/92 mm Hg and 166/96 mm Hg. She currently takes no medications. She does not smoke or drink alcohol. She exercises four times weekly. She is employed as a police officer and describes her work as stressful. She is 173 cm (5 ft 8 in) tall and weighs 59 kg (130 lb); BMI is 20 kg/m^2. Her blood pressure is 160/94 mm Hg in both arms while sitting and 162/92 mm Hg in the right arm while standing. The remainder of the examination shows no abnormalities. Laboratory studies show:

Serum	
Na^+	141 mEq/L
K^+	3.2 mEq/L
Cl^-	103 mEq/L
HCO_3^-	30 mEq/L
Urea nitrogen	15 mg/dL
Creatinine	0.9 mg/dL
Aldosterone:renin ratio	42
Urine aldosterone	34 µg/24 h (N=3–20)

An MRI of the abdomen shows no abnormalities. The most appropriate next step in management is to add which of the following to this patient's regimen?

A) Diltiazem
B) Doxazosin
C) Lisinopril
D) Losartan
E) Spironolactone
F) Triamterene-hydrochlorothiazide

Correct Answer: E.

Spironolactone therapy is indicated for the management of secondary hypertension in hyperaldosteronism. Primary hyperaldosteronism presents with hypertension, metabolic alkalosis, hypokalemia, and an increased aldosterone-to-renin ratio as a result of the independent secretion of aldosterone, most commonly from an adrenal adenoma or bilateral adrenal hyperplasia. Aldosterone promotes the reabsorption of sodium ions in exchange for potassium and hydrogen ion secretion in the renal distal convoluted tubule and collecting ducts, causing the indirect reabsorption of water, which results in the development of hypertension. High concentration of aldosterone provide negative feedback to renin, decreasing its production. As the MRI did not demonstrate any significant findings, this patient's hyperaldosteronism is likely caused by idiopathic adrenal hyperplasia rather than an adrenal adenoma. Spironolactone is a potassium-sparing diuretic that serves as an aldosterone receptor antagonist. This causes diminished effects of aldosterone on the renal collecting tubules, which results in decreased sodium reabsorption and potassium secretion.

Incorrect Answers: A, B, C, D, and F.

Diltiazem (Choice A) is a non-dihydropyridine calcium channel blocker that decreases blood pressure by causing arteriolar vasodilation. Doxazosin (Choice B) is a selective α1-adrenergic antagonist, which is effective in reducing hypertension through vasodilation of arterioles. Neither of these anti-hypertensives impact aldosterone concentration or aldosterone receptor binding, and thus would not effectively address the underlying cause of hypertension in hyperaldosteronism.

Lisinopril (Choice C) is an ACE inhibitor and losartan (Choice D) is an angiotensin II receptor blocker, which both exert their effects upstream of aldosterone in the renin-angiotensin-aldosterone pathway. Neither would provide any clinical benefit in a patient with hyperaldosteronism, as renin and angiotensin II concentrations are already typically suppressed as a result of excess aldosterone.

Triamterene-hydrochlorothiazide (Choice F) is a combination of two mechanistically distinct diuretics. Triamterene is a potassium-sparing diuretic and acts on the aldosterone-sensitive sodium channels in the collecting tubules. Hydrochlorothiazide is a thiazide diuretic, which inhibits sodium chloride transport in the distal convoluted tubule. While spironolactone is also a potassium-sparing diuretic, it is a better choice in the treatment of hyperaldosteronism as it targets the aldosterone receptor directly.

Educational Objective: Primary hyperaldosteronism presents with hypertension, metabolic alkalosis, hypokalemia, and an increased aldosterone-to-renin ratio caused by the independent secretion of aldosterone, most commonly from an adrenal adenoma or bilateral adrenal hyperplasia. Spironolactone is a potassium-sparing diuretic that serves as an aldosterone receptor antagonist and is indicated for the management of secondary hypertension in hyperaldosteronism.

48. A 52-year-old woman with systemic sclerosis (scleroderma) comes to the physician because she has had an increasingly painful ulcer on her left small toe for the past month. The ulcer was caused by minor trauma. She has not had fever or chills. A 10-day course of oral ciprofloxacin and daily application of topical antibiotic cream have not resolved the ulcer. Despite acetaminophen and ibuprofen therapy, she rates her pain as a 7 on a 10-point scale. Her other medications are prednisone and hydroxychloroquine. Her temperature is 37.2°C (99°F), pulse is 84/min and regular, and blood pressure is 145/85 mm Hg. Examination shows skin changes over the face and hands consistent with scleroderma. The left small toe is erythematous and edematous. There is a 1-cm, shaggy, fibrinous, full-thickness ulcer on the dorsum of the proximal interphalangeal joint; there is crepitus on palpation of the joint. The bone is visible. Cellulitis extends along the dorsum of the foot. The posterior tibial pulse is palpable. Culture of the ulcer grows methicillin-resistant *Staphylococcus aureus*. Which of the following is the most appropriate next step in management?

A) Hyperbaric oxygen therapy

B) Oral methotrexate therapy

C) High-dose oral prednisone and dicloxacillin therapy

D) Local debridement and topical mupirocin ointment

E) Amputation of the toe

Correct Answer: E.

Amputation of the toe is the most appropriate next step in management of this non-healing ulcer in the setting of systemic sclerosis. Systemic sclerosis (scleroderma) is an autoimmune disorder characterized by collagen deposition and progressive fibrosis of the skin, soft tissues, and internal organs as well as a noninflammatory vasculopathy. As a result of vascular involvement, non-healing ulcers of the distal digits are common. In this case, the ulcer has led to osteomyelitis, or infection of the bone and bone marrow. If bone is visible or palpable within the wound, the risk of osteomyelitis increases significantly. Osteomyelitis typically presents acutely, subacutely, or chronically from direct inoculation, as in this case, or hematogenous spread. Unlike the cellulitis over the dorsal foot, which is easily treated with systemic antibiotics, osteomyelitis is significantly more challenging to treat, particularly when a non-healing ulcer is the cause. Healing of the wound is not likely in this case caused by the patient's systemic sclerosis. Thus, surgical management by amputation of the infected toe is needed to achieve source control and prevent further spread of the infection.

Incorrect Answers: A, B, C, and D.

Hyperbaric oxygen therapy (Choice A) is used as a treatment of nonhealing wounds. However, this wound is complicated by osteomyelitis, which requires surgical management.

Oral methotrexate therapy (Choice B) is used in the treatment of systemic sclerosis and other autoimmune conditions. After this patient's acute infection is managed, an immunosuppressive medication such as methotrexate may be indicated to manage the patient's systemic sclerosis. However, in the setting of active osteomyelitis, starting an immunosuppressive medication without treating the infection is inappropriate.

High-dose oral prednisone and dicloxacillin therapy (Choice C) would not treat methicillin-resistant *Staphylococcus aureus*. Even with the correct antibiotic, penetration of the infected bone in a poorly vascularized area is not likely to be effective. Surgical management is a more appropriate next step.

Local debridement and topical mupirocin ointment (Choice D) is inadequate for the treatment of osteomyelitis. Topical antibiotic therapy is appropriate for superficial infections such as impetigo or folliculitis and may be used as an adjuvant in the treatment of chronic wounds. However, it will not address the osteomyelitis associated with this wound.

Educational Objective: Systemic sclerosis is characterized by a noninflammatory vasculopathy, which increases the risk of digit ulceration. Osteomyelitis is a serious complication of these ulcers and requires aggressive management, often surgical.

49. A 32-year-old man comes to the physician because of severe throbbing headaches that have been increasing in frequency over the past 3 months. He has a 10-year history of similar headaches that typically last 6 to 12 hours and are associated with nausea, vomiting, and photophobia. The headaches used to occur approximately every 6 months but now occur twice weekly. He is unable to identify any precipitating factors. Over-the-counter medications have been ineffective. He is otherwise healthy and active. His temperature is 37°C (98.6°F), pulse is 72/min, and blood pressure is 120/75 mm Hg. Examination shows no abnormalities. Which of the following is the most appropriate prophylaxis for his headaches?

A) Carbamazepine
B) Cyproheptadine
C) Ergotamine
D) Propranolol
E) Sumatriptan
F) Tramadol

Correct Answer: D.

Migraine is a common condition that presents with recurrent primary headaches. Migraine headaches are typically severe, unilateral, throbbing, and associated with nausea, vomiting, photophobia, and phonophobia. The pain is usually located behind or adjacent to the eye. Some patients additionally experience an aura before or during the headache, which may present with visual disturbance such as the perception of scintillating shapes or lines paresthesia. Migraine triggers include stress, menstruation, weather changes, fasting, and alcohol. Sleep may improve migraines. Migraines are postulated to arise from deficient serotonin inhibition of descending pain pathways. Acute migraine treatment includes triptans (serotonin 1b/1d agonists) and/or nonsteroidal anti-inflammatory drugs. For patients with disabling or frequent migraines, prophylactic treatment to reduce the frequency of migraine headaches is also recommended and includes lipophilic β-adrenergic blocking drugs that cross the blood-brain barrier (eg, propranolol, metoprolol), antidepressants such as tricyclic antidepressants and serotonin-norepinephrine reuptake inhibitors, and anticonvulsants such as topiramate or valproate.

Incorrect Answers: A, B, C, E, and F.

Carbamazepine (Choice A) is an anticonvulsant medication utilized to treat seizures and bipolar disorder. As a result of the risk of hepatotoxicity and bone marrow suppression, carbamazepine should not be utilized as a first-line medication for migraine prophylaxis.

Cyproheptadine (Choice B) is a serotonin antagonist used to treat serotonin syndrome. A serotonin antagonist would not be helpful in preventing migraines.

Ergotamine (Choice C) and sumatriptan (Choice E) act as serotonin agonists on the intracranial vasculature and are utilized in acute migraine treatment. When used chronically, ergot and triptan medications may increase the frequency of migraine headaches.

Tramadol (Choice F) is an opioid agonist utilized as a general analgesic. When chronically used, opioid medications can cause daily headaches.

Educational Objective: Migraines are typically unilateral, pulsating headaches that are associated with nausea, vomiting, photophobia, and phonophobia, and may present with a visual or sensory aura. For patients with disabling or frequent migraines, prophylactic treatment to reduce the frequency of migraine headaches is recommended and includes β-adrenergic blocking drugs, antidepressants, and anticonvulsants.

50. A 37-year-old man with hepatitis C and HIV infection comes to the physician because of a 2-week history of edema and generalized fatigue. He has not had fever, vomiting, or any other symptoms. He is taking antiretroviral therapy. One month ago his CD4+ T-lymphocyte count was 240/mm^3 (N≥500). He was treated for *Mycobacterium avium-intracellulare* complex infection 2 years ago. His blood pressure is 150/96 mm Hg. Examination shows pitting edema from the midcalves to the feet bilaterally. Laboratory studies show:

Serum	
Urea nitrogen	20 mg/dL
Creatinine	1.8 mg/dL
Urine	
Blood	negative
Protein	4+

Microscopic examination of urine shows no cells or casts. Which of the following is the most appropriate next step in management?

A) Urine cytology
B) Discontinuation of antiretroviral therapy
C) Prednisone therapy
D) Renal biopsy
E) Hemodialysis

Correct Answer: D.

Nephrotic syndrome is characterized by edema secondary to excessive proteinuria resulting in hypoalbuminemia and diminished intravascular oncotic pressure. This occurs because of loss of the normal size and charge filtration capability of the glomerular capillary and Bowman capsule interface. Causes of nephrotic syndrome include minimal change disease, membranous nephropathy, and focal segmental glomerulosclerosis (FSGS). Patients classically present with dependent edema in the buttocks, lower back, and legs, foamy or dark-colored urine, hypoalbuminemia, and proteinuria. Nephrotic syndrome can occur in association with HIV infection, and the most common type of HIV-associated nephropathy is FSGS. FSGS is most commonly associated with sickle cell disease, opioid abuse, and HIV infection, and is characterized by segmental sclerosis of the glomeruli. A kidney biopsy is necessary to confirm the underlying pathology, which assists in treatment planning. Treatment may include steroids or immunomodulators, though many cases result in end-stage kidney disease and the eventual need for hemodialysis.

Incorrect Answers: A, B, C, and E.

Urine cytology (Choice A) is performed in the diagnosis of urinary tract malignancy. Urinary tract cancers typically present with microscopic or gross hematuria, which is not present in this patient. This patient's proteinuria is caused by a nephrotic syndrome.

Discontinuation of antiretroviral therapy (Choice B) would be inappropriate as this patient's CD4+ T-lymphocyte count continues to be below normal values, increasing risk for opportunistic infections.

Prednisone therapy (Choice C) is used to treat multiple inflammatory, atopic, infectious, and autoimmune conditions. It may be attempted once a diagnosis is established, though it does not have a specific role in management prior to diagnosis.

Hemodialysis (Choice E) is indicated in end-stage kidney disease or when acute kidney injury causes severe acidemia, electrolyte disturbances such as hyperkalemia, volume overload, or uremia. Although this patient does exhibit pitting edema, the patient is not in a sufficiently significant state of volume overload to require hemodialysis at this time.

Educational Objective: HIV-associated nephropathy classically presents as FSGS, a nephrotic syndrome characterized by proteinuria, dependent edema, and hypoalbuminemia. A kidney biopsy is necessary to confirm the underlying pathology, which assists in treatment planning.

1. A 14-year-old girl is brought to the office by her parents because of a 4-month history of “antisocial behavior.” During this period, she has spent less time with her girlfriends and has spent most of her time with her 16-year-old boyfriend. Three months ago, she quit the school volleyball team and will not tell her parents why. Her parents say she has become unwilling to discuss many aspects of her life with them, including her boyfriend and her sexual activity. She receives grades of B's and C's in school, but her parents worry that her grades will worsen. They report that she eats and sleeps well. During the examination, the patient is silent but polite. When her parents ask her to look at them, she refuses. When interviewed alone, the patient says she finds her parents “overbearing” and “intrusive.” She says she quit the volleyball team because she would rather devote that time to her boyfriend and her increasingly challenging studies. She says she is “madly in love” with her boyfriend; with the exception of class and study time, she wants to spend as much time with him as possible. She reports that they have been intimate but that she will not have sexual intercourse until the age of 17 years. She keeps in touch with her friends through texting and social media. Which of the following is the most likely diagnosis?

A) Adjustment disorder

B) Conduct disorder

C) Dependent personality disorder

D) Oppositional defiant disorder

E) Normal development

Correct Answer: E.

This patient is demonstrating behaviors reflective of normal development. According to Erikson’s stages of psychosocial development, a key developmental task for adolescents is to formulate their identity as an independent person. This task involves recognizing that their parents possess their own flawed identities and separating from their parents. A degree of teenage rebellion is normal. Also, adolescents commonly pursue a primary attachment with a romantic partner. Adolescents may be more prone than adults to becoming infatuated with their romantic partner.

Incorrect Answers: A, B, C, and D.

Adjustment disorder (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated anxiety, depression, or conduct disturbances. This patient has not experienced a stressor, and the changes in her conduct toward her parents are consistent with normal psychosocial development.

Conduct disorder (Choice B) refers to a persistent pattern of violating others’ rights, including aggression, deceitful behavior, and property destruction. Patients must demonstrate this behavior for 12 months, whereas this patient’s behavior changes have lasted only 4 months and do not include violating the rights of others.

Dependent personality disorder (Choice C) features a persistent and pervasive need to be cared for, leading to clinging behavior. This patient’s dependent behaviors are specific to her new boyfriend, not pervasive. As well, patients must be 18 years or older to be diagnosed with a personality disorder.

Oppositional defiant disorder (Choice D) manifests as a persistent pattern of angry mood, defiant behavior, and vindictiveness that causes distress and impaired functioning in the child or their caretakers. Symptoms must persist 6 months or longer, whereas this patient’s behavior has endured 4 months only. As well, this patient’s resistant behavior is consistent with normal psychosocial development; it is not excessive or impairing.

Educational Objective: In normal development, adolescents form their own identity and may separate from their parents in the process. Adolescents also commonly become infatuated with romantic partners.

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2. An asymptomatic 72-year-old woman comes to the physician for an annual health maintenance examination in the fall. She takes no medications. At the age of 65 years, bone densitometry showed normal findings. At her last visit 1 year ago, a Pap smear, mammography, and sigmoidoscopy showed no abnormalities; her serum cholesterol concentration was 190 mg/dL, and serum glucose concentration was 80 mg/dL. She has been married for 50 years and remains sexually active. She does not smoke and drinks one to two glasses of wine three times weekly. She is 165 cm (5 ft 5 in) tall and weighs 63 kg (140 lb); BMI is 23 kg/m^2. Her blood pressure is 140/85 mm Hg. Physical examination, including pelvic examination, shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Measurement of fasting serum glucose concentration
B) Serum lipid studies
C) ECG
D) Influenza virus vaccination
E) Sigmoidoscopy

Correct Answer: D.

Influenza virus vaccination is the most appropriate next step in management for this otherwise healthy 72-year-old woman. The influenza vaccine comes in two forms: an intramuscular inactivated virus vaccine and an intranasal live-attenuated virus vaccine. In most cases, patients should receive the inactivated version of the vaccine. Each vaccine is redesigned each year to protect against a variety of different influenza strains and should be given yearly, usually at the beginning of the influenza season (generally September-December in the northern hemisphere). The only contraindication to receiving the intramuscular influenza vaccine is a prior severe allergic reaction to the vaccine or its components. Additionally, children less than 6 months old should not receive the vaccine.

Incorrect Answers: A, B, C, and E.

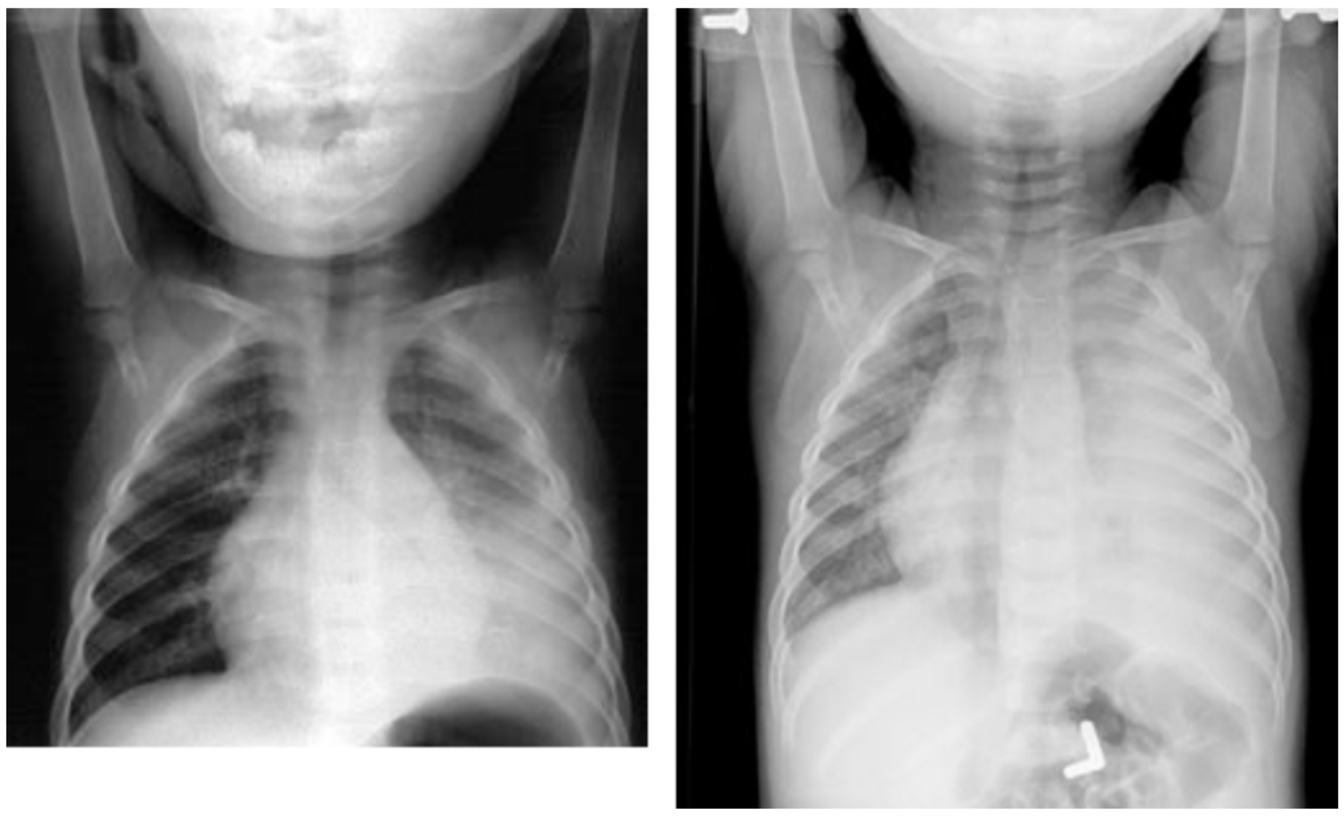
Measurement of fasting serum glucose concentration (Choice A) was measured 1 year ago and was 80 mg/dL, which is normal. Yearly testing for diabetes mellitus is only recommended in patients between the ages of 40 to 70 years who are overweight or obese.

Serum lipid studies (Choice B) are typically recommended at least once for asymptotic men over the age of 35 years and women over the age of 40 years and may be repeated every 3 to 5 years thereafter. This patient's cholesterol was checked 1 year ago.

ECG (Choice C) is not recommended as a screen for asymptomatic patients in the ambulatory setting.

Sigmoidoscopy (Choice E) is completed every 5 to 10 years to screen for colon cancer and is done in conjunction with the fecal immunochemical test.

Educational Objective: The intramuscular influenza vaccine should be given yearly to all patients over the age of 6 months. The only contraindication to receiving the intramuscular influenza vaccine is a prior severe allergic reaction to the vaccine or its components.



3. A 3-year-old boy is admitted to the hospital because of a 5-day history of fever and cough. Since the age of 6 months, he has been treated for recurrent episodes of acute otitis media and has been hospitalized twice for treatment of pneumonia and once for treatment of viral meningitis. He was born at term following an uncomplicated pregnancy and delivery. His immunizations are up-to-date. He has no known drug allergies. He currently receives no medications or herbal or vitamin supplements. His maternal uncle died of sepsis at the age of 6 years. The patient has two healthy sisters and a 3-month-old brother who has no history of infection. The patient is at the 10th percentile for height, weight, and head circumference. His temperature is 39°C (102.2°F). Examination shows no lymphadenopathy and absence of tonsils. Crackles are heard over the left lung base. Laboratory studies show:

Total B lymphocytes	1%
Total T lymphocytes	91%
Serum	
IgA	8 mg/dL
IgG	60 mg/dL
IgM	10 mg/dL

A PPD skin test and HIV antibody test are negative. X-rays of the chest are shown. In addition to intravenous antibiotic therapy for treatment of this patient's current symptoms, which of the following is the most appropriate next step in management?

A) Subcutaneous granulocyte colony-stimulating factor therapy
B) Subcutaneous interferon gamma-1b therapy
C) Complement replacement therapy
D) Intravenous immune globulin therapy
E) Bone marrow transplant

Correct Answer: D.

Intravenous immune globulin therapy (IVIG) administration is the next most appropriate step in management for this patient with nearly absent levels of IgA, IgG, IgM, and a family history of an affected maternal uncle. This presentation is consistent with X-linked agammaglobulinemia. X-linked agammaglobulinemia is typically defined by defects in the Bruton tyrosine kinase (*BTK*) gene. *BTK* is necessary for all stages of B-lymphocyte development and proliferation and a deficiency of this enzyme results in failed B lymphocyte development. As B lymphocytes are responsible for secreting immunoglobulins once they differentiate into plasma cells, a defect in B-lymphocyte maturation leads to a dearth of plasma cells and severely low immunoglobulin concentration of every class, including IgM, IgG, IgE, and IgA. Patients present with recurrent infections caused by impaired humoral immunity and treatment is with IVIG concentrates. This patient has evidence of bacterial pneumonia and should receive intravenous antibiotics in addition to IVIG.

Incorrect Answers: A, B, C, and E.

Subcutaneous granulocyte colony-stimulating factor therapy (Choice A) is typically reserved for patients who have recently received cytotoxic chemotherapy and are expected to experience prolonged periods of profound neutropenia.

Subcutaneous interferon gamma-1b therapy (Choice B) is a treatment for chronic granulomatous disease, not agammaglobulinemia.

Complement replacement therapy (Choice C) is rarely indicated for patients with complement deficiencies as it has shown little benefit as a prophylactic measure. Indications such as severe infection may justify the use of fresh frozen plasma to replace complement proteins.

Bone marrow transplant (Choice E) is not used for agammaglobulinemia but is a curative treatment for severe combined immunodeficiency syndrome.

Educational Objective: Patients with X-linked agammaglobulinemia have mutations in the BTK gene that encodes a tyrosine kinase essential for all stages of B-lymphocyte development and proliferation. They present with recurrent infections and low or absent immunoglobulin concentrations.

4. A 25-year-old woman comes to the emergency department 45 minutes after the onset of shortness of breath, marked malaise, weakness, and fatigue. She felt well until 24 hours ago when she developed muscle soreness after an unusually strenuous physical workout; she took ibuprofen for pain 1 hour before the dyspnea began. She has a history of frequent migraines that have been prevented by taking metoprolol during the past month. Her blood pressure is 100/70 mm Hg. Examination shows facial flushing and mild periorbital edema. Multiple wheezes are heard throughout the lung fields. During the examination, the patient's dyspnea becomes more severe. Her respirations are 30/min, and blood pressure is now 90/50 mm Hg. Her inspiratory ratio is approximately 1:1. There is circumoral cyanosis. Which of the following is the most appropriate pharmacotherapy?

A) Diphenhydramine
B) Epinephrine
C) Hydroxyzine
D) Methylprednisolone
E) Ranitidine

Correct Answer: B.

Anaphylactic shock, a severe type I hypersensitivity reaction, presents following exposure to an allergen. It is caused by widespread IgE-mediated mast cell degranulation and is characterized by histaminergic responses within multiple organ systems leading to flushing, angioedema, bronchospasm, nausea, vomiting, abdominal discomfort, and vasodilation, which can lead to airway obstruction and circulatory collapse. It is generally acute in onset following a specific exposure and generally does not self-resolve. If not managed promptly, death can occur from hypoxia or distributive shock. Anaphylaxis is a form of distributive shock, which is characterized by a primary reduction in systemic vascular resistance (SVR). This reduction in SVR is secondary to IgE-mediated histamine and cytokine release. Cardiac output increases to compensate for low SVR in the early stages of distributive shock. If the inciting state is not appropriately treated, further decompensation can occur, resulting in progressive hypotension and insufficient perfusion with associated end-organ damage. The diagnosis is made clinically, and treatment requires intramuscular epinephrine, inhaled β-adrenergic agonists, glucocorticoids, histamine blockers, fluid resuscitation, and potentially invasive airway or additional vasopressor support. Epinephrine is the most important therapy, which reverses the effect of the distributive shock and reduces airway edema and bronchospasm. It carries a demonstrated mortality benefit in the management of anaphylaxis and should be administered as soon as the condition is suspected.

Incorrect Answers: A, C, D, and E.

While diphenhydramine (Choice A), hydroxyzine (Choice C), methylprednisolone (Choice D), and ranitidine (Choice E) can all be used in the management of anaphylaxis, they are adjuncts to epinephrine, which is the most important intervention in the treatment of anaphylaxis.

Educational Objective: Anaphylaxis is characterized by histaminergic responses within multiple organ systems leading to flushing, angioedema, bronchospasm, nausea, vomiting, abdominal discomfort, and vasodilation, which can lead to airway obstruction and circulatory collapse. The diagnosis is made clinically, and treatment requires intramuscular epinephrine, inhaled β-adrenergic agonists, glucocorticoids, histamine blockers, fluid resuscitation, and potentially invasive airway or additional vasopressor support.

5. A previously healthy 32-year-old woman comes to the physician because of a 2-day history of fever and an area of swelling and redness on her right forearm. Six hours ago, she noticed red streaks extending from her forearm to her elbow. She has not traveled, and there is no history of trauma. Her temperature is 37.8°C (100°F). Epitrochlear lymph nodes are enlarged. Examination of the distal radial aspect of the right upper extremity shows an 8 x 13-cm warm, erythematous area of edema that is tender to palpation; there is a warm, tender red streak extending from this area to the elbow. There is no wound, ulcer, fluctuance, or palpable cord. Which of the following is the most likely diagnosis?

A) Deep venous thrombosis
B) Lymphangitis
C) Lymphedema
D) Superficial thrombophlebitis
E) Thoracic outlet obstruction

Correct Answer: B.

Lymphangitis refers to inflammation of the lymphatic channels, which is most commonly caused by infection. A variety of pathogens may be responsible, including group A streptococci, *Staphylococcusaureus*, *Pasteurella multocida, Bartonella henselae*, or *Sporothrix schenckii*. Non-infectious causes of lymphangitis such as malignancy or inflammatory conditions are less common. Lymphangitis presents as erythematous, warm, and edematous streaks, which begin distally at a site of injury or infection and then progress proximally toward the draining lymph node basin and cause lymphadenopathy. Cellulitis or erysipelas may be present at the site of inoculation, as in this case. The diagnosis may be made by microscopy and culture via swab, aspirate, or punch biopsy from the site of origin. Treatment of lymphangitis should be targeted to the infectious pathogen isolated.

Incorrect Answers: A, C, D, and E.

Deep venous thrombosis (Choice A) is the presence of a blood clot within a deep vein of the upper or lower extremity. Commonly seen clinical features include unilateral edema, warmth, and erythema with pain along the course of an involved vein. However, this patient's presentation and findings including multiple streaks and lymphadenopathy are more suggestive of lymphatic inflammation than venous inflammation.

Lymphedema (Choice C) presents as non-transient swelling that is initially soft or pitting but over time becomes indurated and woody. It typically lacks erythema and warmth. Patients with lymphedema and other lymphatic malformations are at a higher risk of developing lymphangitis, but there is no evidence of lymphedema in this patient.

Superficial thrombophlebitis (Choice D) demonstrates tenderness, erythema, and induration along a superficial vein. A palpable cord may be present. The multiple streaks and epitrochlear lymphadenopathy present in this patient are more suggestive of lymphangitis.

Thoracic outlet obstruction (Choice E) causes a constellation of findings including extremity pain, swelling, numbness, and tingling. It is caused by an abnormal structure, such as a cervical rib or apical lung tumor, compressing the subclavian artery, subclavian vein, and brachial plexus as they traverse to the arm. This patient's findings are localized to the forearm only and follow a lymphangitic pattern instead.

Educational Objective: Acute lymphangitis refers to inflammation of the lymphatic channels, typically as a result of infection. Lymphangitis presents as erythematous, warm, and edematous streaks, which begin distally at a site of injury or infection and then progress proximally toward the draining lymph node basin and cause lymphadenopathy.

6. A 24-year-old man is brought to the emergency department 20 minutes after being involved in a motor vehicle collision. He was the unrestrained driver. On arrival, he is agitated and incoherent. His pulse is 120/min, respirations are 10/min and labored, and palpable systolic blood pressure is 60 mm Hg. After endotracheal intubation and resuscitation with 2 L of lactated Ringer solution, his pulse and blood pressure remain unchanged; the ventilatory rate is 8/min. Examination shows a 4 x 6-cm ecchymosis over the left sixth and seventh intercostal spaces at the midaxillary line. He groans on palpation of the left chest. Breath sounds are equal bilaterally. There is abdominal distention. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the abdomen
B) CT scan of the chest
C) Aortography
D) Exploratory laparotomy
E) Exploratory left thoracotomy

Correct Answer: D.

The spleen is one of the most common organs damaged during blunt abdominal trauma, with injury patterns such as laceration and rupture. Splenic rupture can cause large amounts of blood to leak into the peritoneal and retroperitoneal spaces, which can result in hemodynamic instability characterized by tachycardia and if severe, hypotension. Patients with splenic injuries may have left upper quadrant tenderness, peritonitis from blood products irritating the peritoneum, or referred pain to the left shoulder secondary to diaphragmatic irritation. In hemodynamically stable patients, minor splenic injuries diagnosed on CT scan may be treated nonoperatively with observation and reassessment. In unstable patients, emergency exploratory laparotomy is required for repair of the injury or splenectomy, depending on the nature and severity of the splenic injury.

Incorrect Answers: A, B, C, and E.

CT scan of the abdomen (Choice A) and chest (Choice B) can identify rib fractures and a splenic laceration or injury, but this patient is too hemodynamically unstable to tolerate further diagnostic tests. Unstable patients after blunt trauma with evidence of intrathoracic or intraperitoneal bleeding require emergency exploratory laparotomy along with blood product replacement.

Aortography (Choice C) involves placement of a catheter and direct injection of contrast in the aorta to evaluate for aortic dissection. It has largely been replaced by other imaging modalities such as CT angiography. Aortic injury is less likely than splenic injury in this case.

Exploratory left thoracotomy (Choice E) is an invasive procedure that allows for control of thoracic hemorrhage, decompression of cardiac tamponade, or management of aortic or pulmonary hemorrhage, and can be indicated in cases of penetrating trauma with hemodynamic instability despite appropriate management, or pulselessness and receiving CPR for less than 15 minutes with witnessed previous signs of life. This patient's hemodynamic instability is likely caused by a splenic injury, which should be managed by exploratory laparotomy, not thoracotomy.

Educational Objective: The spleen is one of the most commonly injured organs in blunt abdominal trauma. It can present with abdominal tenderness and if severe, hemodynamic instability from large volume hemoperitoneum. Unstable patients require exploratory laparotomy for repair of the injury or splenectomy.

7. A 52-year-old man, who remains in the hospital 1 week after undergoing cadaveric renal transplantation, has been crying and feeling hopeless during the past 3 days. He says he worries that he will never get better. Two years ago, he was involved in a motor vehicle collision and required splenectomy. After the procedure, rapid-onset sepsis and end-stage renal disease developed. He had been receiving dialysis since then. The transplant has not been functioning well, and he has required emergency dialysis for the past 6 days. His current medications include prednisone, mycophenolate mofetil, and thyroglobulin. His temperature is 36.9°C (98.4°F), pulse is 74/min, respirations are 18/min, and blood pressure is 126/84 mm Hg. Physical examination shows a well-healing surgical incision over the abdomen. On mental status examination, he is sad and frequently crying, although he says he looks forward to visits from his family. He is fully oriented. Which of the following is the most appropriate next step in management?

A) Electroconvulsive therapy
B) Escitalopram therapy
C) Lorazepam therapy
D) Psychodynamic psychotherapy
E) Supportive psychotherapy

Correct Answer: E.

This patient is demonstrating a normal emotional response to a difficult situation (crying after waiting years for a transplant and then having the transplant fail). Since his emotional reaction is proportionate to the stressor, he does not meet criteria for adjustment disorder. He also does not meet major depressive disorder (MDD) criteria, as he does not endorse neurovegetative symptoms (eg, energy, sleep, or appetite disturbances) or anhedonia (he continues to enjoy family visits), and he does not meet the duration criteria of 2 weeks. The medical team should deliver brief supportive psychotherapy to support him through this acute stressor. Supportive psychotherapy refers to talk therapy that aims to improve functioning and relieve distress via forging a therapeutic alliance, providing validation of emotions, offering praise of strengths, and collaboratively solving problems. Supportive psychotherapy is a versatile psychotherapeutic modality that can be applied by any clinician to a wide range of patient presentations.

Incorrect Answers: A, B, C, and D.

Electroconvulsive therapy (Choice A) involves the induction of a generalized seizure and is indicated in patients with refractory mood or psychotic disorders or catatonia. This patient does not possess a mood disorder diagnosis.

Escitalopram therapy (Choice B) is a selective serotonin reuptake inhibitor utilized in MDD and anxiety disorders. This patient does not possess a mood or anxiety disorder diagnosis.

Lorazepam therapy (Choice C) is a benzodiazepine medication utilized to treat severe episodic anxiety, convulsions, and alcohol withdrawal. Given the cognitive risks of lorazepam and this patient's lack of severe episodic anxiety, lorazepam therapy should be avoided.

Psychodynamic psychotherapy (Choice D) is an insight-oriented psychotherapy utilized for a range of anxiety, mood, and personality disorders in which the patient's unconscious motivations and conflicts are explored. This patient does not possess a psychiatric diagnosis. As well, psychodynamic psychotherapy is typically a long-term therapy, as the therapist must build a therapeutic alliance before exploring the patient's unconscious conflicts.

Educational Objective: Demonstrating tearfulness during an acutely stressful situation commonly represents a normal emotional reaction. To help the patient through the acute stressor, the physician should deliver supportive psychotherapy.

8. A 16-year-old girl is brought to the office by her parents because of a 3-month history of depressed mood, decreased energy, and decreased confidence. Her parents say they are perplexed by their daughter's recent lack of motivation. The patient's grades have declined from A's and B's to mostly C's during this time. She says she no longer cares about being admitted to a competitive college and feels hopeless about the future. She aspires to be a writer and has been upset that she was not chosen to be the editor of her school newspaper when the position was filled 4 months ago. She and her parents immigrated to the USA from Korea 9 years ago. The patient has no history of serious medical or psychiatric illness and takes no medications. Her maternal aunt and grandmother have anxiety disorders. The patient does not drink alcohol or use illicit drugs. Physical examination shows no abnormalities. On mental status examination, she has a depressed mood and restricted affect. She reports passive suicidal ideation but no active suicide plans or attempts. She reports no hallucinations. There is no evidence of delusions. Which of the following is the most likely underlying cause of this patient's symptoms?

A) Acculturation problem
B) Adjustment disorder
C) Major depressive disorder
D) Persistent depressive disorder (dysthymia)
E) Phase of life problem

Correct Answer: C.

This patient with 3 months of depressed mood, decreased energy, anhedonia, hopelessness, decreased confidence, and passive suicidal ideation meets criteria for major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia (eg, decreased motivation), guilt or worthlessness (eg, extreme decreases in confidence), difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt everyday functioning (eg, declining grades in school). The most effective treatment includes both psychotherapy and antidepressant medication. If a patient endorses active suicidal ideation, then inpatient psychiatric hospitalization should be strongly considered.

Incorrect Answers: A, B, D, and E.

Acculturation problem (Choice A) refers to anxiety or depressed mood related to the stress of assimilating into a new culture. It would be atypical for anxiety or depression related to acculturation to begin several years after an individual is immersed into a new culture.

Adjustment disorder (Choice B) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated anxiety or depressive symptoms or conduct disturbances that do not meet the diagnostic criteria for MDD. Since this patient meets criteria for MDD, she is disqualified from receiving the adjustment disorder diagnosis.

Persistent depressive disorder (dysthymia) (Choice D) refers to two or more depressive symptoms lasting longer than 2 years. This patient's symptoms have lasted only 3 months.

Phase of life problem (Choice E) refers to stress secondary to major life transitions such as divorce or retirement. This patient has not undergone any major life transitions recently and instead meets criteria for MDD.

Educational Objective: Symptoms of MDD include two or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, and/or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance).

9. A 37-year-old woman is hospitalized because of a 1-year history of recurrent abdominal pain and diarrhea; exploratory laparoscopy on two occasions showed no abnormalities. A stool chart shows more than 10 painful bowel movements daily for 2 weeks; the pain was relieved with defecation. Physical examination and rectosigmoidoscopy with biopsy show no abnormalities. Her erythrocyte sedimentation rate is within the reference range. Test of the stool is negative for occult blood, ova, and parasites and positive for phenolphthalein. Which of the following is the most likely diagnosis?

A) Anxiety disorder due to a general medical condition
B) Conversion disorder
C) Factitious disorder
D) Hypochondriasis
E) Somatization disorder

Correct Answer: C.

In factitious disorder, patients produce symptoms (eg, take a laxative to produce diarrhea, purposely injure themselves) for primary gain. Primary gain is the motivation to be cared for, which constitutes an unconscious motivator for the patient's conscious production of symptoms. Early losses, neglect, or abuse may disrupt patients' identity and relationships, and adopting the sick role may represent patients' attempts to cope with stress and stabilize their identity and relationships. Psychiatric comorbidities (eg, major depressive disorder, substance use disorders, personality disorders) are common but not present in all patients. Diagnosis is supported by inconsistencies in the history or physical examination, a history of extensive clinical evaluations, or direct evidence of the patient voluntarily producing symptoms. This patient's extensive negative clinical evaluations and stool positive for phenolphthalein, a compound previously used in laxatives, indicate that she is likely ingesting laxatives to consciously produce diarrhea. Treatment includes regular follow-up with one physician who oversees management (as opposed to symptom-triggered appointments) and possible psychotherapy.

Incorrect Answers: A, B, D, and E.

Anxiety due to a general medical condition (Choice A) refers to anxiety that is a physiological consequence of a medical condition. This patient does not demonstrate significant anxiety or evidence of an underlying medical condition.

Conversion disorder (Choice B), more commonly known as functional neurological disorder, involves neurological symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. This patient does not demonstrate neurologic dysfunction, and her fabrication of symptoms is more consistent with factitious disorder.

In hypochondriasis (Choice D), more commonly known as illness anxiety disorder, patients demonstrate persistently excessive anxiety and preoccupation about the possibility of having or acquiring a serious illness such that they perform frequent health-related behaviors or exhibit maladaptive avoidance. Fabrication of symptoms is more consistent with factitious disorder, and this patient does not express anxiety about the possibility of possessing a serious medical condition.

In somatization disorder (Choice E), more commonly known as somatic symptom disorder, the patient is excessively preoccupied with one or more somatic symptoms such that these symptoms disrupt the patient's daily life. Patients persistently devote excessive time and energy to these symptoms or related health concerns (eg, repeatedly going to the doctor). Though this patient devotes excessive time to her symptoms, the fabrication of symptoms is more consistent with factitious disorder.

Educational Objective: In factitious disorder, patients consciously produce symptoms for primary gain. A history of multiple procedures, subjective or objective findings that are inconsistent with a known disease, and direct evidence of symptom fabrication suggest factitious disorder.

10. A 25-year-old woman comes to the physician because of a 2-week history of episodes of dizziness. She says that during the episodes, she feels as though the room is spinning. She also has had ringing in her ears, hearing loss, and a sensation of fullness in her right ear during this time. The episodes occur suddenly, last 30 minutes, and resolve spontaneously. Four months ago, she had a 2-week period of similar episodes that did not involve hearing loss; those episodes resolved spontaneously. She has no history of serious illness and takes no medications. On examination, Weber test lateralizes to the left. Rinne test shows that air conduction is greater than bone conduction bilaterally. Hallpike maneuver is negative. Audiometry shows low-frequency, sensorineural hearing loss on the right. Vestibular testing shows no abnormalities. Rapid plasma reagin is negative. An MRI of the brain shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Amoxicillin therapy
B) Canalith repositioning maneuver
C) High-sodium diet
D) Meclizine therapy
E) Methylprednisolone therapy

Correct Answer: D.

Meniere disease is a condition of vestibular dysfunction and sensorineural hearing loss that results from pressure accumulation in the endolymph of the inner ear including the otolithic organs, semicircular canals, and cochlea. The classic triad of symptoms includes episodic vertigo, hearing loss, and tinnitus. The diagnosis is based on clinical symptoms and audiometric evidence of sensorineural hearing loss. The diagnosis may be supported by results of the Weber and Rinne tests, in which bone conduction assesses for sensorineural hearing and air conduction assesses for conductive hearing. Unilateral sensorineural hearing loss leads to lateralization of bone conduction of a midline stimulus to the unaffected ear (Weber test) and greater air conduction than bone conduction in the affected ear (Rinne test). Vestibular testing may be normal or show unilateral peripheral vestibular dysfunction as the disease progresses. Management includes lifestyle modification (eg, avoidance of salt, nicotine, alcohol, or stress) and medications for episodic vertigo. Antihistamine medications (eg, meclizine, promethazine) are commonly utilized to treat episodic vertigo and nausea.

Incorrect Answers: A, B, C, and E.

Amoxicillin therapy (Choice A) is commonly utilized to treat otitis media. Otitis media typically leads to conductive, not sensorineural, hearing loss without significant vertigo.

Canalith repositioning maneuver (Choice B) would be effective for benign positional paroxysmal vertigo, during which a displaced otolith enters the semicircular canals. The otolith leads to erroneous sensations of head movement and consequent episodic vertigo. However, the cochlea is unaffected, resulting in preserved hearing.

High-sodium diet (Choice C) can lead to fluid retention, resulting in increased endolymphatic pressure. Patients with Meniere disease should adhere to a low-sodium diet.

Methylprednisolone therapy (Choice E) may be utilized for refractory Meniere disease. However, first-line interventions such as lifestyle modification and medications to treat episodic vertigo should be trialed first.

Educational Objective: Meniere disease is a condition of episodic vertigo and sensorineural hearing loss that results from pressure accumulation in the endolymph of the inner ear. Patients typically present with episodic vertigo, hearing loss, and tinnitus. Antihistamine medication (eg, meclizine) is commonly utilized to treat episodic vertigo and nausea.

11. A 6-year-old boy is brought to the physician because of hair loss and a lump on his scalp. His mother says that she first noticed the lump 5 days ago and it appears to be increasing in size. There is no history of serious illness, and he takes no medications. His temperature is 37°C (98.6°F). A photograph of the lesion is shown. A tender 2-cm occipital lymph node is palpated. Which of the following is the most likely causal organism?

A) Group A streptococcus
B) Herpes simplex virus
C) *Mycobacterium scrofulaceum*
D) *Staphylococcus aureus*
E) *Trichophyton tonsurans*

Correct Answer: E.

Trichophyton tonsurans is the most common causal organism of tinea capitis, a fungal infection of the scalp that is common in children. The most common presentation is scaly patches with alopecia and concomitant lymphadenopathy. The patches of alopecia may also demonstrate black dots that represent broken hairs or pustules. When a significant inflammatory response to the fungal infection develops, a kerion develops. This is indicated by a boggy texture and swollen appearance on examination and is present in this case. Tinea capitis is caused by dermatophytes including *T. tonsurans*, *Epidermophyton floccosum*, and *Microsporum canis*. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine. Both griseofulvin and terbinafine have a risk of hepatotoxicity. Patients and their parents should be counseled to monitor for signs of liver damage including right upper quadrant abdominal pain, severe pruritus, jaundice, or scleral icterus, though routine laboratory studies are not indicated. Additionally, close contacts of patients should also be examined as tinea capitis is contagious and can be spread through fomites, such as shared combs, pillows, or hats.

Incorrect Answers: A, B, C, and D.

Group A streptococcus (Choice A) and *Staphylococcus aureus* (Choice D) are both common bacterial causes of cutaneous infections such as impetigo, folliculitis, cellulitis, and erysipelas. However, tinea capitis is a fungal infection, not a bacterial infection.

Herpes simplex virus (Choice B) causes a variety of cutaneous presentations including orolabial ulcers, herpetic whitlow, and eczema herpeticum. The typical appearance is of a clear vesicle, which is followed by a painful shallow ulcer when ruptured. This patient's presentation is more consistent with tinea capitis, which is caused by a dermatophyte infection instead.

Mycobacterium scrofulaceum (Choice C) is a common cause of lymphadenitis in children. In this case, the patient's swollen occipital lymph node is secondary to tinea capitis rather than caused by a primary infection.

Educational Objective: Tinea capitis is a fungal infection of the scalp that is common in children, which causes patches of alopecia with concomitant lymphadenopathy. The most commonly identified pathogen in the United States in *T. tonsurans*, a dermatophyte. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine.

12. A 15-year-old boy is brought to the physician because of a painful lump in his right thigh for 3 weeks. Two months ago, he was kicked in the right thigh during a soccer game and had a bruise over the right femur. He has had no fever. Examination shows a mass in the distal anterior right thigh; the area is warm and tender to deep palpation. The circumference of the right thigh is larger than the left. Flexion and extension of the right knee are limited. An x-ray of the right femur and knee shows evidence of bone destruction with irregular, ragged, radiolucent defects and new bone formation. Which of the following is the most appropriate next step in diagnosis?

A) Ultrasonography of the distal thigh
B) Bone densitometry
C) Fine-needle aspiration of the knee joint for culture
D) Open biopsy of the bony lesion
E) No further diagnostic studies necessary

Correct Answer: D.

This pediatric patient with a subacute course of post-traumatic swelling and an abnormal x-ray likely has underlying osteosarcoma and biopsy is needed to confirm the pathologic diagnosis. Osteosarcoma is the most common primary osseous malignancy in children. It is characterized by cells with enlarged nuclei and a disorganized tissue structure that demonstrates areas of osteoid production (mineralized collagen that provides the structure of bone). This malignancy is locally destructive to bone and can erode through the cortex resulting in a periosteal reaction with elevation of the periosteum along with irregular, ragged borders and areas of disorganized osteogenesis as seen in this case. It typically occurs in long bones, often involving the tibia or femur. The initial presentation generally includes pain and swelling, though a fragility fracture may be the declaring presentation. Osteosarcoma has a high rate of metastasis to the lungs and high mortality rate, even with adequate surgical resection. Even when initial staging does not detect metastatic disease, individual or small groups of cells may have already metastasized but remain below the threshold of detection. Diagnosis involves imaging and tissue sampling; in this case, the best next step is open biopsy of the bony lesion, though practically speaking, advanced imaging (eg, MRI) may precede invasive testing. Treatment typically includes surgical resection combined with chemotherapy.

Incorrect Answers: A, B, C, and E.

Ultrasonography of the distal thigh (Choice A) is appropriate for imaging soft tissue lesions such as cysts or abscesses, and to detect vascular abnormalities such as deep venous thrombosis or arterial occlusions. However, it is not able to provide definitive confirmation of malignancy or the additional information needed for histologic tumor staging.

Bone densitometry (Choice B) may be appropriate in cases of suspected rickets; however, this patient has a specific lesion shown on x-ray with otherwise normal surrounding bone, and a history that is more concerning for malignancy.

Fine-needle aspiration of the knee joint for culture (Choice C) would be a reasonable step in the evaluation of potential septic arthritis. Septic arthritis presents with knee swelling, erythema, and systemic signs and symptoms of infection (eg, fever, chills, nausea, tachycardia). X-rays would not generally demonstrate a bony destructive lesion unless osteomyelitis were also present.

No further diagnostic studies are necessary (Choice E) is incorrect, as the x-rays raise suspicion for a destructive malignancy, uncovered incidentally in the setting of trauma, which is quite common for osteogenic sarcomas.

Educational Objective: Osteosarcoma is the most common primary osseous malignancy in children. It presents with bony destruction, visualized on x-rays as cortical/periosteal irregularity and elevation. Definitive diagnosis requires a biopsy for histopathologic analysis.

13. A 48-year-old man, who was admitted to the hospital 3 days ago for treatment of multiple injuries sustained during a motor vehicle collision, suddenly develops left-sided substernal chest pain. On admission, a right chest tube was placed for treatment of a hemopneumothorax and multiple right-sided rib fractures. He also sustained a right femur fracture, which was surgically repaired 2 days ago, and a grade II liver laceration, which was treated nonoperatively. Vital signs now are temperature 37.2°C (99.0°F), pulse 120/min and irregularly irregular, respirations 26/min, and blood pressure 90/50 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 100%. The patient appears anxious, and his breathing is labored. Auscultation of the lungs discloses mildly diminished breath sounds on the right but no wheezes or crackles. Abdominal examination discloses no abnormalities. Which of the following is the most appropriate immediate next step in evaluation of this patient?

A) Chest x-ray
B) Complete blood count
C) Duplex ultrasonography of the lower extremities
D) ECG
E) Echocardiography

Correct Answer: D.

A patient who suddenly develops substernal chest pain associated with tachycardia, hypotension, and respiratory distress should be evaluated with an ECG to rule-out acute myocardial infarction. Disruption of the coronary arteries can occur with blunt chest trauma either from direct injury (coronary artery dissection, intimal tear, vascular spasm) or mechanical rupture of an existing atherosclerotic plaque. Even without direct coronary artery involvement, trauma can exacerbate existing coronary artery disease by placing extreme stress on the body and increasing myocardial demand. If the infarction results in left ventricular dysfunction, patients may experience cardiogenic pulmonary edema resulting in shortness of breath, tachypnea, hypoxia, audible rales, and an S_3 or S_4 gallop. Diagnosis is made using clinical history, analysis of cardiac biomarkers, and an ECG, which may show ST-segment elevation or depression, inverted T-waves, or Q-waves. Treatment requires the use of antiplatelet agents (eg, aspirin, clopidogrel) plus anticoagulants (eg, heparin), pain control, and revascularization through angioplasty, thrombolysis, or coronary artery bypass grafting.

Incorrect Answers: A, B, C, and E.

Chest x-ray (Choice A) and complete blood count (Choice B) are also indicated in the work-up of this patient's chest pain, tachycardia, hypotension, and respiratory distress to evaluate for chest tube complications, hemothorax, anemia, pneumonia, and other potential causes. However, acute myocardial infarction is higher on the differential and obtaining an immediate ECG should take priority. If the ECG, laboratory studies, and chest x-ray show no abnormalities, echocardiography (Choice E) can also be useful to evaluate for systolic or diastolic dysfunction, intravascular volume status, and pericardial effusion.

Duplex ultrasonography of the lower extremities (Choice C) is unlikely to provide useful information in the immediate evaluation of the patient. Pulmonary embolism is a possible cause of the patient's symptoms and a CT angiography of the pulmonary arteries would be the preferred diagnostic study. Lower extremity ultrasonography may be utilized if the rest of the work-up discloses no abnormalities, and the patient is unable to safely receive contrast for the CT angiography.

Educational Objective: The immediate evaluation of a patient with substernal chest pain and vital sign abnormalities consists of a clinical history, physical examination, ECG, and cardiac biomarkers to rule-out acute myocardial infarction.

14. A 76-year-old man comes to the physician because of a 5-week history of shortness of breath. He has no history of serious illness and takes no medications. His pulse is 110/min, respirations are 22/min, and blood pressure is 118/68 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Examination shows jugular venous distention to above the mandible bilaterally. The distention increases with inspiration. Which of the following is the most likely diagnosis?

A) Acute myocardial infarction
B) Constrictive pericarditis
C) Left ventricular heart failure
D) Left ventricular heart failure and pulmonary edema
E) Pulmonary edema

Correct Answer: B.

Jugular venous distension that increases with inspiration, also called Kussmaul sign, is suggestive of constrictive pericarditis as the cause of this patient's symptoms. Normally, inspiration results in a decrease in jugular venous distension as a result of negative intrathoracic pressure and increased flow of blood from the venous system into the right heart. Increased jugular venous distension with inspiration indicates impaired right ventricular filling, which can be caused by a stiffened and poorly compliant pericardium, restrictive cardiomyopathy, pericardial effusion and tamponade, large pulmonary embolism, tricuspid stenosis, and severe right heart failure. Pericarditis can be caused by viral infections, connective tissue disease, tuberculosis, malignancy, or as a result of cardiac surgery or radiation, or may be idiopathic. Patients may be asymptomatic or present with dyspnea and pleuritic chest pain that is typically exacerbated with lying down and alleviated by leaning forward. Treatment of pericarditis is typically supportive with colchicine and non-steroidal anti-inflammatory medications (NSAIDs), such as ibuprofen.

Incorrect Answers: A, C, D, and E.

Acute myocardial infarction (Choice A) can damage a significant portion of myocardium and result in left ventricular heart failure (Choice C), with impaired forward flow, pulmonary or systemic venous congestion, and jugular venous distension. The jugular venous distension would be expected to decrease with inspiration in these cases.

Left ventricular heart failure and pulmonary edema (Choice D) would not account for the positive Kussmaul sign, nor would pulmonary edema (Choice E) alone. Restricted ventricular filling, pulmonary venous congestion, and mild pulmonary edema likely explain the patient's decreased oxygen saturation.

Educational Objective: Jugular venous distension that increases with inspiration, also called Kussmaul sign, indicates impaired right ventricular filling. Causes include constrictive pericardial disease, restrictive cardiomyopathy, pericardial effusion, large pulmonary embolism, tricuspid stenosis, and severe right heart failure.

15. A 49-year-old man comes to the clinic for an initial health maintenance examination. He has not been evaluated by a physician during the past 20 years. Medical history is unremarkable. His only medication is as-needed acetaminophen. Family history is remarkable for the death of his maternal grandmother at age 82 years and of his father at age 58 years from ruptured aortic aneurysms. The patient's brother underwent elective repair of an aortic aneurysm at age 57 years. The patient has smoked one-half pack of cigarettes daily for 24 years. He drinks four alcoholic beverages and several cups of coffee daily. He does not exercise regularly. He is 183 cm (6 ft) tall and weighs 107 kg (235 lb); BMI is 32 kg/m^2. Temperature is 37.1°C (98.8°F), pulse is 92/min, respirations are 18/min, and blood pressure is 144/86 mm Hg. Physical examination discloses central obesity. No other abnormalities are noted. Which of the following interventions is most likely to have the greatest benefit for this patient based on his personal risk factors?

A) Doxycycline therapy

B) Elimination of caffeine from the patient's diet

C) Metoprolol therapy

D) Smoking cessation program

E) Weekly exercise regimen and weight-loss program

Correct Answer: D.

Based on his personal risk factors, the patient is most likely to have the greatest benefit from a smoking cessation program to reduce the risk of a ruptured aortic aneurysm. Abdominal aortic aneurysms most commonly occur in men with a history of smoking, positive family history, and a history of atherosclerotic disease. Other risk factors include hypercholesterolemia, hypertension, and trauma. They commonly occur in the infrarenal abdominal aorta and may present as a palpable, pulsatile abdominal mass if large and in a thin patient. Ruptured aneurysms require emergent surgical intervention and repair. Smoking cessation will also reduce the patient’s lifetime risk of developing cardiovascular disease and chronic pulmonary disorders.

Incorrect Answers: A, B, C, and E.

Doxycycline therapy (Choice A) is used for prophylaxis and therapeutic treatment of a number of infectious organisms. It would not have a large benefit for this patient.

Elimination of caffeine from the patient's diet (Choice B) may help with hypertension, tremor, and insomnia if present, but smoking cessation will have a greater benefit for the patient.

Metoprolol therapy (Choice C) has a potential but unproven benefit in preventing expansion of a known aortic aneurysm and is not typically prescribed. It would not provide the greatest benefit at this time.

Weekly exercise regimen and weight-loss program (Choice E) should be recommended for this patient as his BMI indicates an increased risk for obesity-related complications. The presence of a significant family history for aortic aneurysms in multiple family members argues that addressing his current tobacco use should take priority.

Educational Objective: Abdominal aortic aneurysms most commonly occur in mem with a history of smoking, positive family history, and a history of atherosclerotic disease. Smoking cessation provides the greatest risk reduction for developing an aortic aneurysm, and for expansion and rupture of an existing aneurysm.

16. A 34-year-old woman comes to the physician because of a 2-year history of episodes of nasal congestion and clear discharge, frequent sneezing, and moderate “sinus pressure.” Her symptoms occur throughout the year. She has no history of asthma, hives, generalized swelling, or known allergies. She takes no medications. Her parents are allergic to cats. The patient has never had a pet. She has never smoked cigarettes. She lives on the fourth floor of a large apartment complex. She appears in no distress. Her temperature is 36.7°C (98°F), pulse is 68/min, respirations are 12/min, and blood pressure is 113/67 mm Hg. Examination shows pale, edematous nasal mucosa; no other abnormalities are noted. Which of the following is the most appropriate recommendation for this patient?

A) Immunotherapy
B) Moving to a newly constructed apartment complex
C) Moving to an apartment on a lower floor
D) Reupholstering of bedroom furniture
E) Use of pillow and mattress covers

Correct Answer: E.

Allergic rhinitis is characterized by IgE-mediated inflammation (type I hypersensitivity) of the nasal mucosa. Patients commonly experience nasal or sinus congestion, rhinorrhea, sneezing, nasal pruritus, conjunctivitis, and tearing. Common inciting allergens include plant pollens, animal dander, dust, and mold, whose presence may be seasonally dependent. Patients with allergic rhinitis may display signs of atopic disease processes, such as asthma or eczema. First-line treatment is with inhaled nasal corticosteroids (eg, fluticasone); other options include inhaled leukotriene receptor antagonists and oral antihistamines. Second-generation antihistamines, such as cetirizine, may be preferable for many patients because of their reduced central nervous system effects, such as somnolence. Removal or avoidance of the offending allergen is essential to prevent further exacerbations and improve symptoms, although this may be impractical for patients with seasonal allergies. Encasing bedding in impermeable pillow and mattress covers can reduce exposure to dust mites and may help with symptoms of allergic rhinitis.

Incorrect Answers: A, B, C, and D.

Immunotherapy (Choice A) can be used to treat allergies when other allergy treatments such as avoidance, antihistamines, and nasal corticosteroids are insufficient. Immunotherapy can reduce sensitivity to some allergens and is indicated in patients who are severely allergic or unable to avoid specific allergens.

Moving to a newly constructed apartment complex (Choice B) is an unreasonable recommendation and may be inconvenient or impractical for the patient. The patient should first try low-cost and easily facilitated interventions such as the use of pillow and mattress covers. Moving to an apartment on a lower floor (Choice C) would also be unlikely to be helpful. Reupholstering of bedroom furniture (Choice D) may release dust and mold, exacerbating the patient’s allergic rhinitis.

Educational Objective: The first step in treating allergic rhinitis is removal or avoidance of any offending allergens. Encasing bedding in impermeable pillow and mattress covers can reduce exposure to dust mites and may help with symptoms of allergic rhinitis.

17. A 67-year-old man is brought to the emergency department by his wife because of a 3-day history of fever and cough productive of blood-tinged, green sputum. She says he was reluctant to come to the hospital and she had to insist. He has type 2 diabetes mellitus. He does not take any medications. On questioning about his alcohol use, he says he sometimes drinks a little too much, especially when he is traveling for his job. He has smoked two packs of cigarettes daily for 30 years. On arrival, he appears slightly disheveled and smells strongly of cigarette smoke. He coughs frequently during the examination. His temperature is 38.9°C (102°F), pulse is 96/min and regular, and blood pressure is 110/65 mm Hg. Rhonchi are heard throughout the lung fields, most prominently on the right. A grade 2/6 systolic murmur is heard best at the left sternal border. The liver is firm, and the edge is palpated 3 cm below the right costal margin. There is trace pedal edema. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hematocrit	37%
Leukocyte count	16,500/mm^3
Segmented neutrophils	85%
Lymphocytes	15%
Platelet count	99,000/mm^3
Serum	
Alkaline phosphatase	350 U/L
AST	95 U/L
ALT	97 U/L

A chest x-ray shows an infiltrate in the middle of the right lung with a dense area of consolidation. Results of a sputum culture are pending. In addition to antibiotic therapy, which of the following is the most appropriate next step in diagnosis?

A) Blood cultures
B) Sputum culture for fungi
C) Sputum culture for tuberculosis
D) CT scan–guided needle aspiration of the area of consolidation
E) Thoracentesis

Correct Answer: A.

Aspiration pneumonia is characterized by fever, cough productive of foul-smelling sputum, malaise, and chest discomfort following an aspiration event. Patients at higher risk of aspiration include those with impaired airway-protective reflexes (eg, Parkinson disease, stroke, myasthenia gravis, depressed mental status), those with frequent or forceful emesis (eg, alcohol use disorder - potentially in this case, cyclic vomiting syndrome), or those with abnormal pharyngeal or airway anatomy (eg, malignancy, trachea-esophageal fistula). These patients are more likely to aspirate gastric contents into the lung, which results in bacterial seeding with gastrointestinal or oral flora and can lead to pneumonia. Frequently, aspiration occurs in the dependent segments of the lung such as bilateral lower lobes (especially the right lower lobe) when erect or the lingula, right middle lobe, and superior segments of the lower lobes while lying down. After diagnosis of pneumonia is made, the next appropriate step is administration of antibiotics. Blood cultures should be drawn in all patients presenting with sepsis, as the potential presence of bacteremia necessitates aggressive and careful management; therapy should be targeted against any identifiable organisms.

Incorrect Answers: B, C, D, and E.

Sputum culture for fungi (Choice B) or tuberculosis (Choice C) would be unlikely to be helpful in this patient with community-acquired (likely aspiration) pneumonia. Although fungi or mycobacteria can cause pneumonia, this patient has no risk factors of immunocompromise, nor does he reside or work in facilities that are high risk for tuberculosis such as hospitals, homeless shelters, and correctional facilities.

CT scan-guided needle aspiration (Choice D) may be used in the diagnosis of lung abscess. While lung abscess can present with a productive cough and blood-tinged sputum, this patient's primary disease process involves pneumonia and sepsis, and the next most important steps are administration of antibiotics and drawing blood cultures.

Thoracentesis (Choice E) is indicated in cases of pneumonia complicated by pleural effusion or empyema. Thoracentesis of a parapneumonic effusion can be helpful in diagnosis and management of source control. This patient does not have a parapneumonic effusion and thus thoracentesis would not be indicated.

Educational Objective: Aspiration pneumonia can occur in patients with alcohol use disorder. It often presents with a fever, productive cough, and dependent consolidations on imaging. Blood cultures are an important diagnostic step to direct antibiotic therapy and overall management.

18. A 52-year-old man comes to the physician because of a 6-month history of progressive shortness of breath with exertion. He reports shortness of breath after climbing one flight of stairs and occasional whistling breath sounds. He has no history of serious illness. He has smoked one and one-half packs of cigarettes daily for 36 years. His pulse is 88/min, respirations are 20/min, and blood pressure is 160/88 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98% at rest. Jugular venous pressure is within normal limits. Breath sounds are distant. There is no peripheral edema. Pulmonary function tests show an FEV_1 of 60% of predicted; the FEV_1:FVC ratio is 50% of predicted. In addition to recommending smoking cessation, which of the following is the most appropriate next step in management?

A) Oral glucocorticosteroid therapy
B) Oral leukotriene inhibitor therapy
C) Oral theophylline therapy
D) Long-acting inhaled bronchodilator therapy
E) Oxygen via nasal cannula during sleep

Correct Answer: D.

The patient is presenting with classic symptoms and findings of chronic obstructive pulmonary disease. Chronic obstructive pulmonary disease is characterized by a progressive decline of lung function as a result of the combination of chronic bronchitis and emphysema, resulting in airflow obstruction on expiration. Tobacco use is a major risk factor for developing chronic obstructive pulmonary disease. Daily inhaled combination therapy with a long-acting bronchodilator, such as the β-adrenergic agonist salmeterol or the muscarinic antagonist tiotropium, and an inhaled glucocorticoid is first-line therapy for the chronic management of chronic obstructive pulmonary disease in patients who experience frequent exacerbations (two or more in a year). Chronic obstructive pulmonary disease exacerbations, marked by acute worsening of dyspnea, frequency or severity of cough, and increased production of sputum, may be triggered by viral or bacterial respiratory infections, environmental irritants, pulmonary embolism, or congestive heart failure, among other triggers. Management of chronic obstructive pulmonary disease exacerbations involves the administration of supplemental oxygen to maintain peripheral saturations in the range of 88 to 92%, combination short-acting β-adrenergic agonist and antimuscarinic inhalers or nebulizers, consideration of antibiotics, and systemic corticosteroids.

Incorrect Answers: A, B, C, and E.

Oral glucocorticosteroid therapy (Choice A) is useful for the management of acute exacerbations of chronic obstructive pulmonary disease but is not typically necessary for the management of stable chronic obstructive pulmonary disease. The use of oral glucocorticoids is associated with significant side effects and should therefore be reserved for the management of acute exacerbations.

Oral leukotriene inhibitor therapy (Choice B) is commonly used in the management of asthma but there is currently a lack of evidence in clinical trials to support its efficacy in the management of chronic obstructive pulmonary disease.

Oral theophylline therapy (Choice C) is useful for its bronchodilatory and anti-inflammatory effects. Its usefulness is limited by its narrow therapeutic window and side effect profile, which includes cardiac arrhythmias and central nervous system excitation, along with its deleterious interactions with numerous medications. Inhaled long-acting bronchodilators, such as salmeterol or tiotropium, are typically well-tolerated and have narrowed the clinical indications for theophylline.

Oxygen via nasal cannula during sleep (Choice E) is not necessary for this patient, as he demonstrates an oxygen saturation of 98% at rest. During chronic obstructive pulmonary disease exacerbations, the goal oxygen saturation should target between 88 to 92%. Historically, administration of supplemental oxygen to raise the saturation beyond this amount has been postulated to blunt respiratory drive, though actual evidence for this is limited. It is more probable that the administration of supplemental oxygen worsens ventilation-perfusion mismatch in this patient population.

Educational Objective: Chronic obstructive pulmonary disease is characterized by a progressive decline of lung function as a result of the combination of chronic bronchitis and emphysema, resulting in airflow obstruction on expiration. It is frequently associated with smoking. Daily inhaled combination therapy with a long-acting bronchodilator, such as the β-adrenergic agonist salmeterol or the muscarinic antagonist tiotropium, and an inhaled glucocorticoid is first-line for the chronic management of chronic obstructive pulmonary disease in patients who experience frequent exacerbations.

19. A 62-year-old woman comes to the physician because of a 1-year history of increased flatulence. During this time, she also has had mild abdominal cramps often followed by loose stools. She has not had any weight changes. She has a low-fiber diet and does not drink milk. She drinks three to four cans of diet cola daily and chews sugar-free gum. Examination shows no abnormalities. Laboratory studies show no abnormalities. Ingestion of which of the following is the most likely cause of this patient's flatulence?

A) Aspartame
B) Galactose
C) Gluten
D) Sorbitol
E) Sucrose

Correct Answer: D.

Sorbitol is a sugar alcohol that is commonly used as an artificial sweetener and sugar substitute in diet sodas and sugar free products, such as chewing gum. Sorbitol is poorly absorbed within the small bowel. It therefore exerts an osmotic effect and may draw fluid into the intestinal lumen, leading to osmotic diarrhea, bloating, and abdominal discomfort. Sorbitol may also be used as a laxative. Patients who display symptoms of chronic diarrhea and abdominal discomfort should be queried as to their use of diet and sugar-free products.

Incorrect Answers: A, B, C, and E.

Aspartame (Choice A) is an artificial sweetener that is commonly used as a sugar substitute in diet soda. Aspartame typically produces no significant adverse effects. It may serve as a source of phenylalanine and its consumption should therefore be avoided in patients with phenylketonuria.

Galactose (Choice B) is a monosaccharide and is metabolized to glucose. It typically produces no adverse effects. Its consumption is harmful in patients with galactosemia, who lack enzymes necessary for its conversion to glucose. Patients with galactosemia manifest symptoms from birth and display other systemic symptoms, such as cataracts, hepatomegaly, cirrhosis, or end-stage kidney disease.

Gluten (Choice C) is responsible for celiac disease in gluten-sensitive patients, which presents with chronic diarrhea, steatorrhea, and nutritional deficiencies. Gluten is commonly found in wheat products but is not commonly found in diet soda or sugar-free gum.

Sucrose (Choice E) is a disaccharide that is converted by sucrase-isomaltase to glucose and fructose in the duodenal brush border. Patients with sucrase-isomaltase deficiency demonstrate symptoms during childhood including diarrhea, cramping, bloating, and abdominal discomfort when consuming sucrose.

Educational Objective: Sorbitol is a sugar alcohol that is commonly used as an artificial sweetener and sugar substitute in diet sodas and sugar free products, such as chewing gum. Sorbitol is poorly absorbed within the small bowel and may cause osmotic diarrhea, bloating, and abdominal discomfort when used in excessive quantities.

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20. A 5-year-old boy is brought to the office by his mother for a well-child examination. The family recently moved to the area from another state; the child's last examination was 6 months ago. The mother says the boy has been generally healthy. Vital signs are temperature 37.0°C (98.6°F), pulse 100/min, respirations 20/min, and blood pressure 100/60 mm Hg. Physical examination shows a protuberant umbilicus that enlarges when the boy coughs. Palpation of the umbilicus discloses a 2-cm umbilical ring with no incarcerated tissue. Without treatment, which of the following is the most likely outcome of the child's condition?

A) Incarceration of the right colon
B) Necrosis of the overlying skin
C) Progressive enlargement of the umbilical ring
D) Spontaneous closure of the umbilical ring
E) Volvulus of the small intestine

Correct Answer: C.

An umbilical hernia occurs as a result of failure of spontaneous closure of the umbilical ring. Following birth, the umbilical ring is progressively closed by the rectus abdominis muscles and is accompanied by fusion of the muscular fascial layers and of the peritoneal membrane. Complete closure occurs in most children during infancy. The majority of children with an umbilical hernia experience spontaneous resolution by age 3 years, but children with large defects (>1.5 cm) or persistent defects, are less likely to experience spontaneous closure and may undergo progressive enlargement of the defect over time. Umbilical hernias are associated with hypothyroidism, Beckwith Wiedemann syndrome, trisomy 18 and 21, and Ehlers Danlos syndrome. A minority of patients with persistent defects or who develop intestinal incarceration may require surgical intervention.

Incorrect Answers: A, B, D, and E.

Incarceration of the right colon (Choice A) is unlikely. Umbilical hernias with larger defects are associated with a decreased risk of intestinal incarceration.

Necrosis of the overlying skin (Choice B) may occur in omphalitis, a cellulitis of the umbilical stump and overlying skin. Omphalitis presents with erythema, induration, and discharge of the umbilicus. It may progress to sepsis or necrotizing fasciitis.

Spontaneous closure of the umbilical ring (Choice D) occurs in the vast majority of umbilical hernias but is less likely in children with persistent hernias or large defects.

Volvulus of the small intestine (Choice E) is associated with omphalocele. Omphalocele is characterized by a midline abdominal wall defect with protrusion of the peritoneum and intestines.

Educational Objective: Closure of the umbilical ring by the rectus abdominis muscles occurs in most children during infancy. The majority of children with an umbilical hernia experience spontaneous resolution by age 3 years, but children with large defects (>1.5 cm) or persistent defects are less likely to experience spontaneous closure and may undergo progressive enlargement of the defect over time.

21. A 26-year-old man comes to the emergency department because of a 1-month history of low back pain that has acutely worsened during the past 24 hours. He rates his current pain as a 6 on a 10-point scale. He is in the military, and the pain originally began when he injured his back during a deployment to the Middle East. He was prescribed diazepam and hydrocodone-acetaminophen at that time. During the past 24 hours, the patient reports taking 20 combination tablets containing hydrocodone and acetaminophen, 10 diazepam tablets, and 40 acetaminophen tablets, but his back pain has persisted. Additional medical history is unremarkable, and he takes no other medications. The patient appears to be in moderate distress. Vital signs are temperature 37°C (98.6°F), pulse 88/min, respirations 16/min, and blood pressure 126/84 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 100%. Examination of the back discloses tenderness and muscle spasm to the left of the lumbar spine. The remainder of the physical examination, including neurologic examination, discloses no abnormalities. Which of the following is the most appropriate pharmacotherapy at this time?

A) Acetylcysteine
B) Flumazenil
C) Lipid emulsion
D) Naloxone
E) Sodium bicarbonate
F) No pharmacotherapy is indicated

Correct Answer: A.

This patient who presents with chronic lower back pain has a history of an acute episode of acetaminophen toxicity within the past 24 hours. Acetaminophen poisoning presents with non-specific symptoms of fatigue, malaise, and abdominal pain followed by signs and symptoms of liver failure, including jaundice, altered mental status, coagulopathy, and marked increases in serum transaminases. The majority of patients with acetaminophen toxicity are asymptomatic and have a normal physical examination during the first 24 hours following ingestion and may not develop evidence of hepatoxicity until 24 to 48 hours after ingestion. Acetaminophen toxicity is treated by repleting hepatic stores of glutathione through intravenous or oral administration of N-acetylcysteine. The likelihood of developing significant hepatotoxicity can be stratified by obtaining a serum acetaminophen concentration and plotting the result against the time from ingestion on the Rumack-Matthew acetaminophen nomogram. N-acetylcysteine should be given to all patients at risk for hepatotoxicity caused by excessive acetaminophen ingestion, regardless of symptoms.

Incorrect Answers: B, C, D, E, and F.

Flumazenil (Choice B) is a competitive antagonist at the benzodiazepine site on the γ-aminobutyric acid receptor. Flumazenil is utilized to reverse accidental benzodiazepine overdose in patients who are not chronically dependent and benzodiazepine sedation after surgical procedures in select patients. Its use is limited as it can precipitate seizures.

Lipid emulsion (Choice C) can be administered intravenously and has historically been used as an antidote to toxic exposure to variety of lipophilic substances, including poisons and medications. Lipid emulsion is thought to function as a lipid sink, thereby attracting and concentrating toxins within the serum rather than within peripheral tissues. It is less effective than N-acetylcysteine as an antidote to acetaminophen poisoning.

Naloxone (Choice D) is an opioid receptor antagonist used in the treatment of opiate or opioid overdoses, which classically present with bradypnea and pinpoint pupils. In contrast to acetaminophen poisoning, opioid overdose does not typically present with a prolonged latency period and is excluded by this patient's normal physical exam.

Sodium bicarbonate (Choice E) is used in tricyclic antidepressant overdose in order to prevent cardiac arrhythmia. It has little utility in the treatment of acetaminophen toxicity.

No pharmacotherapy (Choice F) may increase this patient's risk of severe hepatotoxicity and is not the best next step in management.

Educational Objective: The majority of patients with acetaminophen toxicity are asymptomatic and have a normal physical examination during the first 24 hours following ingestion and may not develop evidence of hepatoxicity until 24 to 48 hours after ingestion. The likelihood of developing significant hepatotoxicity can be stratified by obtaining a serum acetaminophen concentration and plotting the result on the Rumack-Matthew acetaminophen nomogram. N-acetylcysteine should be given to all patients at risk for hepatotoxicity caused by excessive acetaminophen ingestion, regardless of symptoms.

22. A 57-year-old man with a history of chronic kidney disease is admitted to the hospital because of a 1-day history of blood in his urine and severe pain in his right side. He has type 2 diabetes mellitus. During the past 5 years, he has passed renal calculi twice. Medications are lisinopril, metoprolol, glyburide, and furosemide. His pulse is 100/min; other vital signs are within normal limits. Abdominal examination shows right flank tenderness. There is trace swelling of the ankles. Laboratory studies show:

Serum	
Urea nitrogen	45 mg/dL
Creatinine	4.3 mg/dL
Urine	
Blood	4+
Protein	4+
RBC	too numerous to count

Serum urea nitrogen and creatinine concentrations are unchanged from 1 month ago. Which of the following is the most appropriate next step in diagnosis?

A) X-ray of the abdomen
B) Intravenous pyelography
C) Renal ultrasonography
D) CT scan of the abdomen without contrast
E) MRI of the kidneys

Correct Answer: D.

This patient's presenting findings of acute flank pain, hematuria, and proteinuria, as well as his history of renal calculi, are consistent with nephrolithiasis. The majority of renal calculi are radioopaque and can be visualized on CT scan. CT scan of the abdomen without contrast is a sensitive modality for the detection of renal calculi. Most radiolucent calculi, including struvite or cystine calculi, but excluding pure matrix and protease inhibitor calculi, are nonetheless visible on CT scan. Renal ultrasonography, while less sensitive, may be useful for the detection of radiolucent calculi. Most patients with small renal calculi (if based on calcium oxalate, which is the most common type) can be treated with thiazide diuretics, a low-sodium diet, and supplementation with potassium citrate. Patients with large calculi may require extracorporeal shock wave lithotripsy or surgical removal with percutaneous nephrolithotomy or ureteroscopic lithotripsy. This patient's baseline increased creatinine puts him at high risk for post-renal azotemia; threats to kidney function should be addressed urgently in such patients.

Incorrect Answers: A, B, C, and E.

X-ray of the abdomen (Choice A) is an inexpensive and widely available modality that is useful for the detection of large, radioopaque calculi. However, x-ray images are vulnerable to attenuation by adipose tissue surrounding the kidney in the retroperitoneal space and may fail to detect small calculi.

Intravenous pyelography (Choice B) provides good sensitivity for the detection of renal calculi but is time-consuming and less sensitive in comparison to a non-contrast CT scan.

Renal ultrasonography (Choice C) is useful for the detection of radiolucent calculi but has poor sensitivity for the detection of small renal calculi. Additionally, if a calculus has migrated to the mid-ureter, ultrasonography sensitivity for detection may decrease.

MRI of the kidneys (Choice E) is less sensitive for the detection of renal calculi in comparison with CT scan, and is time consuming and costly.

Educational Objective: Nephrolithiasis presents with acute onset flank pain and often with hematuria. CT scan of the abdomen without contrast has superior sensitivity for the detection of nephrolithiasis in comparison to plain film x-ray, intravenous pyelography, ultrasonography, and MRI.

23. A 32-year-old woman, gravida 2, para 1, at 32 weeks' gestation comes to the physician for a routine prenatal visit. Her pregnancy has been uncomplicated. Vital signs are within normal limits. Ultrasonography shows a female fetus with moderately severe unilateral hydronephrosis and a normal contralateral kidney; the amniotic fluid volume is normal. Which of the following is the most appropriate next step in management?

A) Term delivery
B) Administration of prenatal diuretics
C) Induction of labor at 33 weeks' gestation
D) Amniocentesis
E) In utero surgical urinary diversion of the hydronephrotic kidney

Correct Answer: A.

Fetal hydronephrosis on ultrasonography can be physiologic or indicative of a congenital urinary tract abnormality, such as ureteropelvic junction obstruction, vesicoureteral reflux, posterior urethral valves, or urethral atresia, among others. The most common physiologic cause is a structural change in the ureteropelvic junction that leads to transient obstruction. Fetal hydronephrosis is more common in male fetuses, can be unilateral or bilateral, and is associated with Down syndrome. It is most commonly diagnosed on prenatal ultrasonography. Evaluation depends on severity and can include genetic testing, serial ultrasonography, and postnatal follow-up. While congenital genitourinary tract abnormalities can cause oligohydramnios, physiologic hydronephrosis less commonly affects amniotic fluid volume. Even with oligohydramnios, however, gravid patients are often followed with nonstress testing until they are full term, at which time the fetus is delivered. Therefore, in this patient whose fetus has unilateral hydronephrosis, no other apparent abnormalities, and has appropriate amniotic fluid volume, term delivery is the most appropriate next step in management.

Incorrect Answers: B, C, D, and E.

Administration of prenatal diuretics (Choice B) is not used in the management of fetal hydronephrosis. Rather, diuretics are generally reserved for the treatment of pulmonary edema related to congestive heart failure during pregnancy.

Induction of labor at 33 weeks' gestation (Choice C) is not indicated in this patient whose fetus is in no apparent distress and has no signs of oligohydramnios or complicating medical conditions. Delivery at 33 weeks' gestation would put this fetus at risk for complications of a premature birth, including respiratory distress, hyperbilirubinemia, bacterial infection with sepsis, and hypoglycemia, among others.

Amniocentesis (Choice D) can be used to analyze the amniotic fluid, which largely consists of fetal urine. Analysis of this fluid can help determine fetal kidney function. However, these tests have not been found to accurately determine postnatal kidney function. Additionally, amniocentesis carries risk to the mother and fetus, such as infection, pain, and fetal loss.

In utero surgical urinary diversion of the hydronephrotic kidney (Choice E) has not been found to improve postnatal outcomes. However, it is occasionally used in cases of post-bladder obstruction, such as that seen with posterior urethral valves, when severe bilateral hydronephrosis is present, as it increases the amount of amniotic fluid by diverting urine into the amniotic sac.

Educational Objective: Fetal hydronephrosis and other congenital abnormalities of the urinary tract are commonly diagnosed on prenatal ultrasound. Management depends on severity and includes genetic testing and counseling, serial ultrasonography, and postnatal evaluation. Measurement of the amniotic fluid volume is important in determining the likely fetal outcome. Patients with fetal hydronephrosis are commonly recommended to undergo term delivery without amniocentesis or intrauterine surgery.

24. A 29-year-old nulligravid white woman comes to the office for a routine health maintenance examination. She has no history of serious illness or operative procedures. She had chickenpox as a child. Her medications are an oral contraceptive and a daily over-the-counter multivitamin that contains folic acid and vitamin A. Her most recent Pap smear 1 year ago showed no abnormalities. Immunizations are up-to-date. She is sexually active with one male partner. They recently became engaged and are considering pregnancy. The patient works as an accountant. She is 168 cm (5 ft 6 in) tall and weighs 70 kg (155 lb); BMI is 25 kg/m^2. Vital signs are within normal limits. Examination shows no abnormalities. Which of the following is the most appropriate next step in evaluation?

A) Hemoglobin electrophoresis
B) Measurement of serum ferritin concentration
C) Measurement of serum folic acid concentration
D) Repeat Pap smear with human papillomavirus testing
E) Serum rubella IgG antibody testing

Correct Answer: E.

Preconception visits allow a healthcare provider to optimize a patient's chances to have a successful pregnancy and healthy child. The purposes of these visits should be to identify risks to the mother or fetus and to intervene when possible to reduce these risks. Typical assessments include evaluating medical conditions (eg, obesity, diabetes mellitus, hypertension), social behaviors (eg, substance use), exposure to teratogens (eg, medications), genetic conditions or family history, and vaccination records. Laboratory evaluation commonly includes rubella and varicella serology to ensure immunity, as well as sexually transmitted infection screening in patients at high risk (eg, multiple sexual partners, no barrier protection). Finally, interventions include folic acid supplementation, abstinence from substance use, medication changes as needed, optimization of medical conditions, and required vaccinations. Ensuring immunity to rubella with serum rubella IgG antibody testing is pertinent, as the rubella vaccination is a live vaccine that cannot be given in pregnancy. If the mother is not vaccinated, rubella infection of the fetus can cause sensorineural deafness, cataracts, congenital cardiac defects, neurodevelopmental delay, and extramedullary hematopoiesis.

Incorrect Answers: A, B, C, and D.

Hemoglobin electrophoresis (Choice A) can be used to screen the patient for hemoglobinopathies, such as sickle cell disease and thalassemia. However, these are more common in patients of African descent. Both thalassemias occur in patients of Southeast Asian descent, and β-thalassemia also occurs in patients of Mediterranean descent. Additionally, the prenatal diagnosis of hemoglobinopathy does not often change pregnancy management.

Measurement of serum ferritin concentration (Choice B) can be used to evaluate anemia, as well as symptoms of iron overload. This patient has no symptoms of anemia, such as fatigue or pallor, and no symptoms of iron overload, such as liver or cardiac disease. Therefore, measurement of serum ferritin is not indicated at this time.

Measurement of serum folic acid concentration (Choice C) can be used to evaluate macrocytic anemia, of which this patient has no symptoms. While folic acid supplementation during both the prenatal period and pregnancy is recommended to prevent neural tube defects, measurement of serum folic acid concentration is not recommended.

Repeat Pap smear with human papillomavirus testing (Choice D) is not indicated as this patient had a normal cytologic study of cells collected from the cervix one year ago. Current recommendations for cervical cancer screening include a cytologic study of cells collected from the cervix every 3 years from age 21 years to 29 years and a cytologic study of cells collected from the cervix with human papillomavirus co-testing every 5 years in patients 30 years or older.

Educational Objective: Preconception visits allow a practitioner to address risk factors that may lead to a complicated or unhealthy pregnancy. This includes evaluating medical conditions, social behaviors, exposure to teratogens, genetic conditions, and vaccination history. Ensuring immunity to rubella with serum rubella IgG antibody testing is pertinent, as the rubella vaccine cannot be given during pregnancy. Rubella infection of the fetus can cause cataracts, cardiac defects, and sensorineural deafness, among other health issues.

25. Twenty-eight hours after spontaneous vaginal delivery of a healthy newborn at 39 weeks' gestation, a 24-year-old woman, gravida 1, para 1, has a temperature of 38.3°C (101°F). Four hours ago, her temperature was 38.6°C (101.5°F). She has no history of serious illness, and her pregnancy was uncomplicated. Labor lasted 14 hours. During delivery, she sustained a second-degree perineal laceration and had an estimated blood loss of 300 mL. The placenta delivered spontaneously 15 minutes later and appeared intact. Her pulse is 88/min, and blood pressure is 120/60 mm Hg. The uterus is tender to palpation; the uterine fundus is firm and 4 cm below the umbilicus. The perineal repair appears intact. There is moderate lochia. The cervix and vagina appear intact. Bimanual examination shows exquisite diffuse tenderness. Which of the following is the most appropriate next step in management?

A) Observation only
B) Cervical culture
C) Pelvic ultrasonography
D) Intravenous antibiotic therapy
E) Dilatation and curettage

Correct Answer: D.

A recent postpartum patient with fever and uterine tenderness raises suspicion for endometritis. Postpartum endometritis is an acute, typically polymicrobial infection of the uterine endometrium involving a mixture of aerobes and anaerobes from the genital tract. During labor and delivery, microbes from the genital tract can enter the uterine cavity and result in postpartum infection. Patients typically present with fever, severe tenderness of the uterine fundus, and mucopurulent vaginal discharge. Risk factors for endometritis include premature or prolonged rupture of membranes, prolonged labor, cesarean delivery, bacterial vaginosis, Group B streptococcus (GBS) colonization, and manual removal of the placenta. Treatment requires intravenous broad-spectrum antibiotics such as clindamycin and gentamicin for appropriate antimicrobial coverage.

Incorrect Answers: A, B, C, and E.

Observation only (Choice A) would be inappropriate, as this patient has signs and symptoms of infection. Allowing her endometritis to go untreated would likely lead to worsening infection, pain, and sepsis.

Cervical culture (Choice B) may help determine the microbiology of her infection. However, endometritis is typically a polymicrobial infection. Additionally, the most appropriate next step in management would be to start antibiotics as soon as possible rather than delay antibiotics to obtain a culture.

Pelvic ultrasonography (Choice C) may allow evaluation of the uterine cavity if there is concern for retained products of conception, which can present similarly to endometritis. However, this would be less likely in a patient that delivered an intact placenta.

Dilatation and curettage (Choice E) can be used in the management of retained products of conception, which can present similarly to endometritis but also may cause uterine bleeding. Retained products of conception would be less likely in this patient that delivered an intact placenta.

Educational Objective: Endometritis presents in the postpartum period with fever and uterine tenderness as a result of an ascending polymicrobial infection. Risk factors include premature or prolonged rupture of membranes, prolonged labor, cesarean delivery, bacterial vaginosis, GBS colonization, and manual removal of the placenta. Treatment includes broad-spectrum intravenous antibiotic therapy.

26. A previously healthy 29-year-old woman comes to the office because of a 6-month history of frequent throbbing right-sided headaches. The headaches are preceded by flashing lights and accompanied by mild nausea. Her symptoms resolve with over-the-counter acetaminophen, aspirin, and caffeine. She has no other history of serious illness and takes no other medications. She is sexually active and has been using a vaginal contraceptive ring (VCR) for the past year. Vital signs are within normal limits. Physical examination, including pelvic examination, shows no abnormalities. The patient is concerned that the VCR is causing her headaches and asks about the use of feverfew herbal supplementation for headache prevention. Which of the following is the most appropriate recommendation for this patient?

A) Continue use of the VCR, and add a combination oral contraceptive to the regimen
B) Continue use of the VCR, and add feverfew to the regimen
C) Continue use of the VCR, and add sumatriptan to the regimen
D) Discontinue use of the VCR, and add a progestin-only oral contraceptive to the regimen
E) Discontinue use of the VCR, and place a copper IUD

Correct Answer: E.

Migraine with aura is a common cause of headache and is characterized by recurrent primary headaches that are typically severe, unilateral, throbbing, and associated with nausea, vomiting, photophobia, and phonophobia. Migraines may be preceded by an aura, such as scintillating scotoma, fortification scotoma, nausea, or paresthesia. Migraines are postulated to arise from deficient serotonin inhibition of descending pain pathways and are characterized by cortical spreading depression. Migraine with aura is associated with an increased risk of stroke, which is increased by approximately two-fold in women using estrogen-containing or combination hormonal contraceptives, such as a vaginal contraceptive ring (VCR). The American College of Obstetricians and Gynecologists considers migraine with aura to be a contraindication to the use of estrogen-containing or combination hormonal contraceptives. The safest recommendation for this patient is to discontinue the use of the VCR and place a copper IUD, which provides highly effective contraception without the use of hormones. Copper is spermicidal and inhibits sperm motility and the acrosomal reaction necessary for fertilization. As well, it induces local inflammatory changes of the endometrium and increases cervical mucus production, further decreasing the chance of successful sperm passage or embryonic implantation in the endometrium. The IUD can be kept in place for up to 10 years and the rate of pregnancy is less than 1%. Potential complications include increased menstrual flow and pain during menses. Contraindications to copper IUD insertion include a copper allergy, Wilson disease, endometrial cancer, and undiagnosed abnormal uterine bleeding.

Incorrect Answers: A, B, C, and D.

Continued use of the VCR and the addition of a combination oral contraceptive (Choice A) is not only redundant but does not address the increased risk of stroke in people with migraines who are prescribed hormonal contraceptives.

Continuing use of the VCR and adding feverfew (Choice B) is incorrect. Feverfew is a flowering perennial plant that has long been used as an antipyretic. While it has been recently studied in several small trials for the treatment of migraines, its superiority compared to placebo is not currently supported by high quality evidence. Further, continued use of the VCR places this patient at an increased risk of stroke.

Continuing use of the VCR and adding sumatriptan (Choice C) does not address the increased risk of stroke. Further, triptan medications, while commonly used as abortive treatment for migraine headaches, are not commonly used for prophylaxis, as their frequent use may lead to medication overuse headaches.

Discontinuing the VCR and adding a progestin-only oral contraceptive (Choice D) is an appropriate strategy for reducing the risk of stroke in this patient. The preponderance of evidence suggests that the use of progestin-only hormonal contraceptives is safe in people with migraines and does not increase the risk of stroke. However, oral contraceptives, in general, are associated with a higher failure rate in comparison to IUDs and a copper IUD is therefore preferable.

Educational Objective: Migraine with aura is associated with an approximately two-fold increased risk in stroke in women using estrogen-containing or combination hormonal contraceptives, such as a VCR. The American College of Obstetricians and Gynecologists considers migraine with aura to be a contraindication to the use of estrogen-containing or combination hormonal contraceptives.

27. A 55-year-old woman comes to the office because of a 5-year history of decreased interest in sexual activity and difficulty achieving orgasm. During this time, she also has had mild vaginal dryness. She has not had pain with intercourse. She says she has been happily married for 25 years and previously enjoyed sexual activity. Menopause occurred 2 years ago, but she continues to have hot flashes. She has hypertension and major depressive disorder. Her medications are lisinopril and fluoxetine. Vital signs are within normal limits. Pelvic examination shows mild vaginal atrophy. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Sex therapy
B) Switching from fluoxetine to bupropion
C) Switching from lisinopril to losartan
D) Systemic hormone therapy
E) Vaginal estrogen therapy

Correct Answer: B.

Increased serotonin likely explains this patient's sexual dysfunction. Fluoxetine is a selective serotonin reuptake inhibitor (SSRI) that increases synaptic serotonin activity and improves mood in patients with major depressive disorder. SSRIs commonly cause sexual dysfunction within all three phases of sexual response (libido, sexual arousal, and orgasm). If the sexual dysfunction is persistent and distressing, management commonly involves lowering the SSRI dose, switching to an antidepressant with a lower risk of sexual dysfunction (eg, bupropion, mirtazapine), or adding bupropion or a phosphodiesterase-5 inhibitor such as sildenafil. Bupropion is an antidepressant medication that increases synaptic dopamine and norepinephrine. It does not affect serotonin and therefore does not cause sexual dysfunction.

Incorrect Answers: A, C, D, and E.

Sex therapy (Choice A) is utilized to address psychological factors contributing to sexual dysfunction. This patient's sexual dysfunction is more likely secondary to fluoxetine.

Switching from lisinopril to losartan (Choice C) is unlikely to be helpful, as angiotensin converting enzyme inhibitors are not generally associated with sexual side effects.

Systemic hormone therapy (Choice D) treats perimenopausal hot flashes and night sweats and has been increasingly utilized in perimenopausal sexual dysfunction. However, this patient's sexual dysfunction preceded menopause.

Vaginal estrogen therapy (Choice E) treats atrophic vaginitis, a common condition in menopause that may cause dyspareunia and an associated decrease in libido. This patient's sexual dysfunction preceded menopause. As well, this patient is experiencing mild vaginal dryness but not any dyspareunia, thus vaginal estrogen therapy would be unhelpful for her sexual dysfunction.

Educational Objective: SSRIs commonly cause sexual dysfunction within all three phases of sexual response (libido, sexual arousal, and orgasm). Patients with distressing sexual dysfunction may be switched to bupropion, an antidepressant that does not affect serotonin and therefore does not cause sexual dysfunction.

28. A 32-year-old woman, gravida 1, para 1, comes to the physician because she has not had a menstrual period for 6 months. During this time, she also has had lethargy, dry skin, and nipple discharge. Menses previously occurred at regular 28-day intervals. She was recently married and would like to have a child with her new husband. She has one child from a previous marriage. A home pregnancy test was negative 1 day ago. On physical examination, clear fluid can be expressed from both nipples. Examination shows no other abnormalities. The most appropriate next step in diagnosis is measurement of which of the following serum concentrations?

A) Estradiol
B) Follicle-stimulating hormone
C) β-hCG
D) Luteinizing hormone
E) Thyroid-stimulating hormone

Correct Answer: E.

Hypothyroidism presents with weight gain, fatigue, constipation, cold intolerance, and may demonstrate heavy or irregular periods. Hypothyroidism is a common cause of female infertility as a result of an increased serum prolactin concentration, which may also be accompanied by nipple discharge, anovulatory cycles, and menstrual flow irregularity. Patients with uncontrolled hypothyroidism who become pregnant are also at an increased risk of miscarriage. Physical examination typically discloses bradycardia, dry, edematous skin, and delayed relaxation of deep tendon reflexes. Patients who present with oligomenorrhea and physical examination findings suggestive of hypothyroidism should undergo screening with thyroid-stimulating hormone testing. Supplementation of thyroid hormone results in the normalization of ovulatory function.

Incorrect Answers: A, B, C, and D.

Estradiol (Choice A) may be decreased in the setting of premature ovarian failure. Oligomenorrhea caused by premature ovarian failure is typically accompanied by other signs and symptoms, such as hot flashes, vaginal dryness, and night sweats.

Follicle-stimulating hormone (Choice B) and luteinizing hormone (Choice D) are decreased in secondary ovarian failure, which most commonly occurs as a result of disorders of the pituitary gland such as prolactinoma or Sheehan syndrome. Prolactinoma may cause galactorrhea but is also accompanied by headaches and visual field changes.

β-hCG (Choice C) measurement is useful in the diagnosis of pregnancy. This is unlikely, as the patient underwent pregnancy testing 1 day prior.

Educational Objective: Hypothyroidism is a common cause of female infertility caused by increased serum prolactin concentration, which may also be accompanied by nipple discharge, anovulatory cycles, and oligomenorrhea.

29. A 32-year-old woman is brought to the office by her husband, who reports that she has had increasingly bizarre behavior during the past 2 days. He says she frequently becomes confused during her daily activities at home, and she occasionally refers to objects and people that are not present. She also appears to be depressed. The patient reports severe spasms in her wrists that cause her wrists to remain flexed for several minutes at a time, and muscle cramps in her legs and feet. Three days ago, she underwent a total thyroidectomy for papillary thyroid cancer. She also has asthma. Medications are albuterol as needed and levothyroxine. She is 162 cm(5 ft 4 in) tall and weighs 59 kg(130 lb); BMI is 22 kg/m^2. Vital signs are within normal limits. The patient appears well nourished and is not in distress. She is alert and oriented to person, place, and time. Affect is flat. There is a well-healing surgical incision on the anterior lower neck. Tapping the left side of the face, anterior to the left ear, results in twitching of the left side of the mouth. Results of serum laboratory studies are most likely to show which of the following?

	Calcium	Phosphate
A)	Decreased	increased
B)	Increased	increased
C)	Decreased	decreased
D)	Increased	decreased

Correct Answer: A.

Hypoparathyroidism is a frequent complication of total thyroidectomy for thyroid malignancy and may result in hypocalcemia and hyperphosphatemia. Under normal conditions, hypocalcemia is sensed by the parathyroid gland via calcium-sensing receptors, leading to an increase in secretion of parathyroid hormone (PTH) to normalize serum calcium concentrations. Increased PTH causes bone resorption, liberating calcium and phosphorus otherwise stored in bone, and also promotes calcium retention and phosphorus excretion in the kidney. Symptoms of hypocalcemia include perioral paresthesia, carpopedal spasm, laryngospasm, prolonged QT interval, and, rarely, frank psychosis. The Chvostek sign, in which tapping of the facial nerve leads to spasm of the facial muscles, and Trousseau sign, in which an inflated blood pressure cuff occluding the brachial artery causes carpopedal spasm, are two physical examination signs that may indicate hypocalcemia. Other causes of hypoparathyroidism include infiltrative disease, inflammatory or autoimmune destruction, or malignancy. The majority of patients who develop hypoparathyroidism following total thyroidectomy improve over several weeks, although a small number of patients develop chronic hypoparathyroidism. Treatment includes intravenous repletion of calcium, supplementation with vitamin D, and replacement of parathyroid hormone.

Incorrect Answer: B, C, and D.

Increased calcium and increased phosphate (Choice B) may be encountered in vitamin D toxicity and may present with symptoms of hypercalcemia, which may be asymptomatic, or which may include symptoms such as kidney stones, bone pain and osteopenia, nausea and vomiting, constipation, or altered mental status and depression.

Decreased calcium and decreased phosphate (Choice C) may be encountered in gastrointestinal malabsorption or vitamin D deficiency. Hypoparathyroidism following parathyroid resection typically results in increased serum phosphate caused by the loss of PTH on the nephron, leading to impaired phosphate excretion.

Increased calcium and decreased phosphate (Choice D) is encountered in primary hyperparathyroidism, which may present with symptoms of hypercalcemia.

Educational Objective: Hypoparathyroidism is a frequent complication of total thyroidectomy for thyroid malignancy and may result in hypocalcemia and hyperphosphatemia. Symptoms of hypocalcemia include perioral paresthesia, carpopedal spasm, laryngospasm, prolonged QT interval, and, rarely, frank psychosis.

30. A 32-year-old woman comes to the emergency department 12 hours after the sudden onset of fever, vomiting, diffuse muscle and bone pain, rash, and dizziness. She has no history of serious illness and takes no medications. Temperature is 39.0°C (102.2°F), pulse is 100/min, and blood pressure is 90/50 mm Hg while supine. Palpable systolic blood pressure is 70 mm Hg while sitting. Examination shows a diffuse, erythematous, macular rash over the face, trunk, hands, and feet. The lungs are clear to auscultation. On cardiac examination, no murmurs or gallops are heard. There is 1+ peripheral edema bilaterally. Neurologic examination shows no focal findings. Which of the following is the most likely explanation for these findings?

A) Meningococcemia
B) Rocky Mountain spotted fever
C) Secondary syphilis
D) Systemic lupus erythematosus
E) Toxic shock syndrome

Correct Answer: E.

Staphylococcus aureus produces an exotoxin called toxic shock syndrome toxin (TSST-1) that causes toxic shock syndrome (TSS). TSS is often associated with the prolonged, continuous use of tampons or nasal packing. TSS presents with fever, a diffuse erythematous macular rash, and distributive shock as a result of endothelial dysfunction causing leakage of fluid from the vascular space to the interstitial space along with diffuse vasodilation. The resultant shock and inflammatory state may lead to multiorgan failure. Manifestations in the gastrointestinal system include abdominal pain, vomiting, diarrhea, and liver failure. Cutaneous involvement may present as a rash of the mucous membranes in addition to diffuse erythroderma and sloughing. Neurologic manifestations may include encephalopathy, confusion, or seizures. Acute respiratory distress syndrome (ARDS) is a feared and serious complication. ARDS is characterized by diffuse inflammatory lung injury and results in dyspnea and hypoxic respiratory failure. End-stage kidney disease, acute anemia, and disseminated intravascular coagulopathy may also occur. Management includes removal of the foreign body (eg, tampon, nasal packing), fluid resuscitation, intravenous antibiotic therapy, and advanced therapy, such as vasopressors and mechanical ventilation, in severe cases.

Incorrect Answers: A, B, C, and D.

Meningococcemia (Choice A) is caused by *Neisseria meningitidis* infection of the blood stream. It typically presents acutely with fever, nausea, vomiting, altered mental status, myalgias, and a diffuse petechial rash. It can quickly evolve to florid shock accompanied by disseminated intravascular coagulation. This patient has a diffuse macular rash, making meningococcemia less likely.

Rocky Mountain spotted fever (Choice B) is a tick-borne illness caused by *Rickettsia rickettsii* infection, which is more common in the southeastern United States. Symptoms include a flu-like illness with fever, myalgias, nausea, and headache. Rash is also common and begins as an erythematous rash that spreads from the wrists and ankles to the trunk, palms, and soles, later becoming petechial in character. This patient has no known history of a tick bite, and Rocky Mountain spotted fever is less likely than TSS to cause distributive shock.

Secondary syphilis (Choice C) presents with nonspecific symptoms such as fever, headache, fatigue, and lymphadenopathy. A morbilliform rash that occurs on the palms and soles is also common, and more severe symptoms, such as meningitis and hepatitis can occur. Secondary syphilis would be unlikely to cause the distributive shock seen in this patient.

Systemic lupus erythematosus (Choice D) is an autoimmune disorder that affects multiple organ systems with a wide variety of symptoms. The skin and mucous membranes, nervous system, musculoskeletal system, and renal system may all be affected. It commonly presents insidiously with initial symptoms including fever, fatigue, and arthralgias. It would be less likely to cause this patient's acute illness.

Educational Objective: TSS is caused by *S. aureus*, often with prolonged tampon use or nasal packing, although it can also occur with a skin infection. It typically presents with fever, a diffuse erythematous macular rash, and severe distributive shock. Complications include multiorgan failure, encephalopathy, seizures, and disseminated intravascular coagulopathy. Management includes removal of the source of infection, fluid resuscitation, intravenous antibiotic therapy, and supportive care with mechanical ventilation and vasopressors for severe cases.

31. A 48-year-old woman comes to the office for consultation before undergoing Roux-en-Y gastric bypass. She says her cousin underwent gastric bypass 1 year ago and developed postoperative nausea, vomiting, confusion, and falling. The patient asks what she can do to prevent this outcome if she undergoes the operation. The patient has type 2 diabetes mellitus, obstructive sleep apnea hypopnea, and hypertension. Medications are metformin, glipizide, atorvastatin, and lisinopril. She is 162 cm (5 ft 4 in) tall and weighs 118 kg (260 lb); BMI is 45 kg/m^2. Temperature is 37.0°C (98.6°F), pulse is 60/min, respirations are 16/min, and blood pressure is 142/90 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Cardiopulmonary examination discloses no abnormalities. Abdomen is obese with no tenderness. The remainder of the examination discloses no abnormalities. Regarding this patient's concerns, it is most appropriate to counsel her that routine supplementation with which of the following will prevent a postoperative outcome similar to that of her cousin?

A) Calcium
B) Folic acid
C) Iron
D) Vitamin B_{12} (cyanocobalamin)
E) Vitamin B_1 (thiamine)
F) Zinc

Correct Answer: E.

Vitamin B_1 (thiamine) is a cofactor for several enzymes in glucose metabolism and adenosine triphosphate production, including pyruvate dehydrogenase and α-ketoglutarate dehydrogenase. Because vitamin B_1 is primarily absorbed in the jejunum, which is partially bypassed in patients who have undergone Roux-en-Y gastric bypass surgery, deficiency in thiamine is a possible sequela of bariatric surgery. The risk of thiamine deficiency is further increased in patients whose post-operative course is complicated by persistent vomiting. Deficiency of vitamin B_1 may result in wet beriberi, dry beriberi,or Wernicke encephalopathy. Dry beriberi is characterized by symmetrical peripheral neuropathy and wet beriberi manifests with high cardiac output heart failure. Wernicke encephalopathy is a neurologic condition causing encephalopathy, gait ataxia, and ophthalmoplegia, and is the most common manifestation of thiamine deficiency in patients after Roux-en-Y gastric bypass. Supplementation of vitamin B_1 is recommended for all post-bariatric surgery patients.

Incorrect Answers: A, B, C, D, and F.

Calcium (Choice A) supplementation is advised in patients after bariatric surgery to prevent hypocalcemia and deficiency of vitamin D. However, confusion and falling are not common symptoms of hypocalcemia.

Folic acid (Choice B) deficiency induces a megaloblastic anemia without neurologic findings. Folic acid should be supplemented in patients after bariatric surgery but will not impact thiamine concentrations.

Iron (Choice C) deficiency is common in patients after bariatric surgery, particularly in women who are still menstruating, and leads to a microcytic anemia. Confusion and falling are not caused by iron deficiency.

Vitamin B_{12} (cyanocobalamin) (Choice D) deficiency causes megaloblastic anemia, subacute combined degeneration of the spinal cord, and peripheral neuropathy. Confusion is more characteristic of vitamin B_1 deficiency.

Zinc (Choice F) is a mineral essential to many enzymes. Deficiency of zinc presents with delayed wound healing, loss of taste and smell, and acrodermatitis enteropathica, not confusion or falling.

Educational Objective: Vitamin B_1 (thiamine) is primarily absorbed in the jejunum, which is partially bypassed in patients who have undergone Roux-en-Y gastric bypass surgery. These patients should take vitamin B_1 supplementation in order to avoid the possible effects of its deficiency, including Wernicke encephalopathy, dry beriberi, and wet beriberi.

32. A 32-year-old man comes to the physician as a new patient. Twice during the past 15 years, he has received treatment in the emergency department for severe wheezing, shortness of breath, and swelling of the face and hands; one episode was triggered by a bee sting and the other by a wasp sting. He has no other history of serious illness. His only medication is self-injectable epinephrine, which he used successfully to prevent a reaction when he was stung by a bee during a camping trip 1 year ago. Examination shows no abnormalities. In addition to self-injectable epinephrine therapy if stung, which of the following is the most appropriate management to decrease this patient's risk for future anaphylactic reactions?

A) Diphenhydramine therapy
B) Oral prednisone therapy
C) Oral ranitidine therapy
D) Inhaled albuterol therapy
E) Venom immunotherapy

Correct Answer: E.

Hymenoptera venom immunotherapy (VIT) is an effective treatment for patients who have allergies to bee stings and develop anaphylactic reactions when stung. Successful VIT leads to the prevention of future anaphylactic events caused by bee or wasp stings. An allergy to hymenoptera venom is an example of a type I hypersensitivity reaction. In this type, preformed IgE on the surface of mast cells and basophils is crosslinked by an antigen. This leads to the immediate degranulation and release of histamine. Type I hypersensitivity reactions may present with symptoms ranging from localized pruritis, edema, and erythema to systemic, life-threatening anaphylaxis. The immunotherapy desensitizes the patient to the venom by allowing IgG antibodies, or "blocking" antibodies to form. When the patient is later exposed to the allergen, such as during a future bee sting, the IgG blocking antibodies block interaction between the allergen and preformed IgE antibodies on the surface of mast cells and basophils. This prevents degranulation and histamine release, and thus prevents an anaphylactic reaction.

Incorrect Answers: A, B, C, and D.

Diphenhydramine therapy (Choice A) and oral prednisone therapy (Choice B) may be used in combination with epinephrine in the immediate management of a patient having an anaphylactic or allergic reaction. However, neither of these medications address the underlying allergic response nor prevent a future attack.

Oral ranitidine therapy (Choice C) is an H_2 receptor blocker and has been used in the treatment of urticaria. However, it is not effective in either the treatment of acute anaphylaxis or preventing future episodes of anaphylaxis.

Inhaled albuterol therapy (Choice D) may be used in the management of acute anaphylaxis when the patient is unresponsive to intramuscular epinephrine or for a triggered asthmatic reaction in the setting of anaphylaxis. It would not decrease the patient's future risk of anaphylactic reactions.

Educational Objective: Hymenoptera VIT is recommended for patients who have severe systemic reactions to bee stings to decrease the risk of future reactions. Anti-venom IgG antibodies, or "blocking" antibodies are created, and upon re-exposure, block the interaction between the allergen and preformed IgE antibodies on the surface of mast cells and basophils to prevent degranulation.

33. A study is conducted to compare the effects of remote patient monitoring (RPM) with the effects of monthly clinic visits for patients with congestive heart failure (CHF). One thousand patients are enrolled in the study; 500 receive RPM and 500 receive monthly clinic visits. Patients are observed for 6 months. Data show:

Outcomes	RPM	Standard Care	Relative Risk Reduction (95% Confidence Interval)
All-cause mortality (%)	13	15	17 (5–27)
Hospitalization for any cause (%)	43	45	3 (–3–8)
Hospitalization for heart failure (%)	20	27	29 (20–36)

Which of the following best represents the number of patients who need to be treated with RPM instead of standard care during a 6-month period to prevent mortality in one patient with CHF?

A) 1
B) 10
C) 20
D) 50
E) 100

Correct Answer: D.

Number needed to treat (NNT) is an epidemiological measure used to characterize an intervention that clarifies the effectiveness of that intervention. Formally, the NNT is the number of patients who must receive an intervention in order to prevent the occurrence of one negative outcome. For example, a cardiovascular drug that needs to be given to 100 people in order to prevent one cardiovascular event would have an NNT of 100. Absolute risk reduction (ARR) is the difference in outcome between the intervention and placebo group. NNT is related to the ARR via the following equation: NNT=1/ARR. In this case, the ARR for all-cause mortality by remote patient monitoring is found by comparing the risk of all-cause mortality in patients treated with standard care (15% or 0.15) to the risk of all-cause mortality in patients treated with remote patient monitoring (13% or 0.13). ARR = 0.15-0.13 = 0.02. Therefore, NNT = 1/0.02 = 50.

Incorrect Answers: A, B, C, and E.

If the NNT were 1 (Choice A), the ARR of remote patient monitoring compared to standard care would be 100%. This would be the equivalent of 100% mortality in the standard care group and 0% mortality in the remote patient monitoring group. In fact, the respective mortality rates are 15% and 13%.

A NNT of 10 (Choice B) and 20 (Choice C) would correspond with an ARR in all-cause mortality of 10% and 5%, respectively. If the NNT were 100 (Choice E), this would correspond with an ARR in all-cause mortality of 1%.

Based on the data, the absolute risk reduction is 2%, leading to an NNT of 50.

Educational Objective: The NNT is the number of individuals who need to receive an intervention in order to prevent one negative outcome. The NNT is calculated as the inverse of the ARR.

34. A new screening test for HIV is implemented in a prison in a Midwestern state. The medical director of the prison wants to know how the new test compares to the one used previously. Which of the following is the most important determinant of the specificity of the test to identify HIV infected prisoners?

A) The proportion of inmates infected with HIV
B) The proportion of inmates with a false negative test
C) The proportion of inmates with a false positive test
D) The proportion of inmates with a negative test
E) The proportion of inmates with a positive test

Correct Answer: C.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Sensitivity is the ability of a test to detect a disease if it is present. Specificity is the ability of a test to be negative when a disease is absent. High sensitivity is therefore useful in ruling out a disease, while specificity is required in order to confirm a diagnosis. Specificity = true negatives (TN)/(TN + false positives (FP)). Specificity is also equal to 1 – false-positive rate. A test is described as specific if it has a low false-positive rate. Thus, the proportion of inmates with a false positive test is the most important determinant of the specificity of the new HIV screening test.

Incorrect Answers: A, B, D, and E.

The proportion of inmates infected with HIV (Choice A), or the prevalence of HIV in the population being studied, will not have any impact on sensitivity or specificity. In contrast, prevalence directly impacts positive predictive value and inversely impacts negative predictive value.

The proportion of inmates with a false negative test (Choice B) would be the most important determinant of the sensitivity of the test. Sensitivity is equal to 1 – false-negative rate. It can also be calculated with the equation sensitivity = true positives (TP)/(TP + false negatives (FN)).

The proportion of inmates with a negative test (Choice D) or with a positive test (Choice E) would impact the negative predictive value and positive predictive value, respectively, not the specificity.

Educational Objective: The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Specificity is equal to 1 – false-positive rate while sensitivity is equal to 1 – false-negative rate.

35. A randomized controlled trial is conducted to assess the safety of uterine artery embolization (UAE) compared with hysterectomy for treatment of leiomyomata uteri with menorrhagia. A total of 350 patients are equally divided to undergo either UAE or hysterectomy. The mean patient age is similar in both groups. Major and minor complications, length of hospital stay, and readmission up to 6 weeks after the procedure are evaluated. Results show:

Group	Major Complication Rates (p=0.68)	Minor Complication Rates (p=0.024)	Total Average Length of Hospital Stay (p<0.001)	Readmission Rates (p=0.003)
UAE	5%	60%	2.5 days	10%
Hysterectomy	3%	40%	5 days	0%

Based on these results, which of the following is the most accurate conclusion regarding the safety of UAE compared with hysterectomy?

A) It is safer to undergo UAE than hysterectomy

B) The length of hospital stay is similar for patients undergoing UAE or hysterectomy

C) Patients who undergo UAE can return to work sooner

D) Readmission rates are similar in both groups

E) UAE and hysterectomy have similar major complication rates

Correct Answer: E.

When conducting any experiment, two hypotheses are created. The null hypothesis, or H_0, states that there is no difference between the two groups being compared, in this case the uterine artery embolization (UAE) and the hysterectomy groups. The alternative hypothesis, or H_1, suggests that there is a difference between the two groups being compared. In this case, four sets of hypotheses are created regarding major complication rates, minor complication rates, total average length of hospital stay, and readmission rates between the two groups. The likelihood of erroneously rejecting the null hypothesis (concluding that the alternative hypothesis is true) is called a type I error. The acceptable rate of a type I error is a percentage called the alpha level and is set by the investigators. When the alpha level is converted to a decimal, it can be compared to the *p*-value of the experiment. An alpha level of 5% or 0.05 indicates that if the null hypothesis is true, there is a 5% chance that the investigators will erroneously reject it based on the study results. A *p*-value of 0.05 or less is generally considered statistically significant. In this case, the investigators found no difference in the major complication rates between the two groups with a *p*-value >0.05. However, the difference in minor complication rates, total average length of hospital stay, and readmission rates did achieve statistical significance as each of these comparisons yielded a *p*-value of <0.05. Thus, in this case, the most accurate conclusion regarding the safety of UAE compared with hysterectomy is that the two groups had similar major complication rates.

Incorrect Answers: A, B, C, and D.

Based on this data, it cannot accurately be stated that it is safer to undergo UAE than hysterectomy (Choice A) because the two groups had major complication rates that were not significantly different from each other and UAE had significantly higher minor complication rates than hysterectomy.

The length of hospital stay was not similar for patients undergoing UAE or hysterectomy (Choice B) but rather differed between the groups by 2.5 days with a *p*-value <0.05.

Based on the data provided, there is no evidence that patients who undergo UAE can return to work sooner (Choice C). This was not an outcome studied by the investigators.

Readmission rates were significantly different between the two groups (Choice D). The UAE group had a readmission rate of 10% while the hysterectomy group had a rate of 0%, which yielded a statistically significant *p*-value of 0.003.

Educational Objective: The *p*-value is the probability that a type I error has been committed and the null hypothesis has been erroneously rejected. A *p*-value of 0.05 or less is considered statistically significant.

36. A previously healthy 52-year-old man is brought to the emergency department by his wife 30 minutes after he had a generalized tonic-clonic seizure, which lasted 90 seconds. He had no prodromal symptoms. His wife reports that he has been "more distant and less engaged" during the past 3 weeks. He has no history of seizures. There is no personal or family history of serious illness. He takes no medications. He smoked two packs of cigarettes daily for 25 years but quit 3 years ago. He drinks one glass of wine weekly. He appears drowsy but is easily aroused. His pulse is 80/min, and blood pressure is 110/78 mm Hg. Funduscopic examination shows sharp disc margins; there is no papilledema. Range of motion of all extremities is full. Deep tendon reflexes are 2+ bilaterally. A CT scan of the chest shows no abnormalities. A CT scan of the head is shown. Which of the following is the most appropriate next step in management?

A) Cryptococcal antigen titer
B) Toxoplasma antibody titer
C) Lumbar puncture
D) Stereotactic brain biopsy
E) External-beam radiation therapy to the brain

Correct Answer: D.

Glioblastoma is an aggressive primary brain astrocytoma, representing a common malignant primary brain tumor in adults. Headaches, seizures, and focal neurological deficits (eg, visual symptoms, motor weakness, cognitive impairment, personality changes) are common presenting symptoms. Glioblastomas typically appear as intra-axial masses in the cerebral hemispheres on neuroimaging, which typically demonstrate intense rim enhancement with central necrosis. Glioblastomas commonly spread to the opposite hemisphere across the corpus callosum, which distinguishes these aggressive tumors from other types of primary brain tumors. The preferred initial step in management is attempted total resection to preserve neurological function and confirm a tissue diagnosis. However, when the tumor is too large or inconveniently located for total resection, a stereotactic biopsy is commonly performed as an initial step to confirm the histologic diagnosis. Next, a combination of radiation therapy and chemotherapy that depends on the specific tissue diagnosis is typically utilized. With treatment, the prognosis is often 15 to 18 months.

Incorrect Answers: A, B, C, and E.

Cryptococcal antigen titer (Choice A) assists in diagnosing cryptococcal meningitis, which typically presents subacutely with fever, headache, nuchal rigidity, and photophobia. It is most common in immunocompromised patients. Neuroimaging is often unremarkable.

Toxoplasma antibody titer (Choice B) assists in diagnosing toxoplasma encephalitis, which commonly presents with headache, fever, and neurologic deficits. It is most common in immunocompromised patients. Toxoplasma lesions appear as ring-enhancing, calcified, focal lesions. Large, bihemispheric lesions with central necrosis are more consistent with glioblastoma.

Lumbar puncture (Choice C) does not play a role in the diagnosis or treatment of glioblastoma multiforme. In any patient with a large intracranial mass, lumbar punctures should be performed with caution because of the possibility of increased intracranial pressure and herniation during the procedure.

External-beam radiation therapy to the brain (Choice E) may be performed after total resection or stereotactic brain biopsy. However, a histologic tissue diagnosis should be confirmed first.

Educational Objective: Glioblastoma is an aggressive primary brain astrocytoma. Glioblastomas typically appear as rim-enhancing, intra-axial masses in the cerebral hemispheres that commonly cross the midline. Surgical management (eg, total resection, stereotactic brain biopsy) is the best initial step to confirm a tissue diagnosis.

37. A 67-year-old man comes to the emergency department 1 hour after the onset of vertigo, nausea, and imbalance. He has a 20-year history of poorly controlled hypertension. His pulse is 70/min, respirations are 20/min, and blood pressure is 210/115 mm Hg. Examination shows a small right pupil, mild right ptosis, and nystagmus. Neurologic examination shows weakness of the right palate. Sensation to pinprick is decreased over the right side of the face and left extremities. There is incoordination on finger-nose testing and heel-knee-shin testing on the right. Which of the following arteries is most likely to be occluded?

A) Anterior spinal
B) Basilar
C) Left anterior cerebral
D) Left internal carotid
E) Left middle cerebral
F) Left posterior cerebral
G) Left vertebral
H) Posterior spinal
I) Right anterior cerebral
J) Right internal carotid
K) Right middle cerebral
L) Right vertebral

Correct Answer: L.

This patient likely has an occlusion of the right vertebral artery leading to a posterior circulation stroke (cerebral infarction). A thrombus of the vertebral artery commonly forms from atherosclerotic disease but may also form as a result of an intimal defect from trauma or vertebral artery dissection. This patient's poorly controlled hypertension likely contributed to atherosclerotic disease of the vertebral artery. The brainstem, cerebellum, and occipital lobes are commonly affected. Patients typically present with vestibulocerebellar signs (ataxia, dysmetria, dizziness, imbalance, vertigo, vomiting, nystagmus), ipsilateral cranial nerve dysfunction (dysphagia, dysarthria, vertical or horizontal gaze palsies), contralateral hemiparesis (as a result of corticospinal tract damage), contralateral impairment in pain and temperature sensation (as a result of spinothalamic tract damage), or potential contralateral homonymous hemianopsia with macular sparing (as a result of occipital lobe involvement). In posterior circulation strokes affecting the lateral pons, Horner syndrome may occur, which presents with ipsilateral ptosis, miosis (pupillary constriction), and ipsilateral facial anhidrosis. If no hemorrhage is demonstrated on non-contrast CT scan of the head, acute management of posterior circulation strokes commonly involves tissue plasminogen activator therapy or thrombectomy.

Incorrect Answers: A, B, C, D, E, F, G, H, I, J, and K.

Anterior spinal artery (Choice A) occlusion typically manifests with bilateral loss of pain and temperature sensation and motor function below the level of the lesion, along with autonomic dysfunction. The anterior spinal artery supplies the bilateral corticospinal, spinothalamic, and autonomic tracts.

The basilar artery (Choice B) is supplied by the vertebral arteries. Basilar artery occlusion commonly presents with acute, severe, bilateral corticospinal and corticobulbar dysfunction, leading to locked-in syndrome.

The left and right anterior cerebral arteries (ACA) (Choices C and I) supply the medial frontal and parietal lobes (primary motor and sensory cortices), which control the motor and sensory function of the lower extremities. Occlusion of an ACA leads to contralateral hemiparesis and sensory deficit of the lower extremities.

The left and right internal carotid arteries (ICA) (Choices D and J) supply the left and right anterior and middle cerebral arteries (MCA) (Choices E and K). The MCA supplies the lateral frontal lobe (primary motor cortex), anterior parietal lobe (primary sensory cortex), and temporal lobe. Occlusion of the ICA or MCA leads to contralateral hemiparesis and contralateral sensory deficit of the face and upper or lower (if involving the ACA) extremities.

The left posterior cerebral artery (PCA) (Choices F), downstream of the left vertebral artery, supplies the left posterior parietal and occipital lobes along with the thalamus and midbrain. Occlusion of the left PCA commonly leads to right homonymous hemianopia with macular sparing and Gerstmann syndrome (agraphia, acalculia, finger agnosia, and left-right disorientation).

Left vertebral artery (Choice G) occlusion would result in left-sided Horner syndrome and cranial nerve deficits and right-sided sensory and motor deficits of the body along with vestibulocerebellar signs and potential right-sided homonymous hemianopia.

The posterior spinal artery (Choice H) supplies the dorsal column-medial lemniscus tract. Patients with posterior spinal artery occlusion present with ipsilateral sensory loss of proprioception, fine touch, and vibration below the level of the lesion.

Educational Objective: Atherosclerotic disease leads to an increased risk of vertebral artery occlusion. Patients with vertebral artery occlusion typically present with vestibulocerebellar signs, ipsilateral cranial nerve dysfunction and Horner syndrome, and contralateral hemiparesis and sensory loss.

38. A 62-year-old man comes to the physician for a routine examination. His paternal grandfather received the diagnosis of dementia, Alzheimer type, at the age of 65 years. The patient says he is "not forgetting things" but wonders whether he might have inherited the disorder. He has major depressive disorder treated with citalopram, hypertension treated with hydrochlorothiazide, and hyperlipidemia treated with atorvastatin. He sustained minor injuries in a motor vehicle collision at the age of 11 years but has no other history of trauma. Today, he appears well. His temperature is 37°C (98.6°F), pulse is 74/min and regular, respirations are 12/min, and blood pressure is 140/80 mm Hg. The remainder of the examination shows no abnormalities. Which of the following factors presents the greatest risk for development of dementia in this patient?

A) Advancing age
B) Closed head injury
C) Family history of dementia
D) Hyperlipidemia
E) Hypertension
F) Major depressive disorder

Correct Answer: A.

Dementia, Alzheimer type, is the most prevalent dementia in elderly patients. In Alzheimer disease (AD), a proteinopathy involving amyloid and tau proteins leads to the degeneration of cholinergic neurons projecting to the cerebral cortex, resulting in progressive impairment of attention, learning, memory, and other cognitive domains. The most significant risk factor for developing AD is advancing age. Other major risk factors include a family history of AD, hypertension, dyslipidemia, cerebrovascular disease, atherosclerosis, and type II diabetes. Down syndrome has been shown to be associated with early-onset AD. Physical activity and management of cardiovascular risk factors have been shown to reduce the risk of AD. Treatment includes cholinesterase inhibitors, which may slow the rate of cognitive decline but do not cure AD.

Incorrect Answers: B, C, D, E, and F.

Whether closed head injury (Choice B) increases the risk of AD is unclear, as studies on traumatic brain injury have demonstrated mixed results.

A family history of dementia (Choice C), hyperlipidemia (Choice D), hypertension (Choice E), and major depressive disorder (Choice F) are AD risk factors but do not predict the development of AD as strongly as advancing age.

Educational Objective: Dementia, Alzheimer type, is the most prevalent dementia, presenting with progressive cognitive decline across several domains. Advancing age is the most significant risk factor for AD.

39. A 2-month-old girl is brought to the physician for a well-child examination. She was born at 39 weeks' gestation following an uncomplicated pregnancy and a cesarean delivery for breech presentation. Apgar scores were 9 and 9 at 1 and 5 minutes, respectively. Her temperature is 37°C (98.6°F), pulse is 120/min, respirations are 20/min, and blood pressure is 75/50 mm Hg. Abduction of the left hip is limited. Manipulation of the hip with and without pressure elicits a palpable clunk. Which of the following is the most appropriate initial step in management?

A) Follow-up examination in 2 weeks
B) Follow-up examination after use of triple diapers for 1 month
C) X-rays of the hips
D) Ultrasonography of the hips
E) No management is indicated

Correct Answer: D.

Developmental dysplasia of the hip (DDH) can present with limited hip range of motion, palpable hip instability, unequal leg lengths, and asymmetric thigh skinfolds. Risk factors for DDH include family history of DDH, breech positioning, female sex, and intrauterine spatial abnormalities such as oligohydramnios. In patients with high clinical suspicion of DDH, ultrasonography is used in the evaluation of DDH to visualize the anatomy of the femoral head and acetabulum. The management of DDH involves reduction of the femoral head in the acetabulum, either by closed reduction and immobilization in a harness or spica casting, or open reduction under general anesthesia. Early intervention allows the best opportunity for development of a normal joint and decreases chances of complications such as premature degenerative arthritis, gait instability, or limb-length discrepancy.

Incorrect Answers: A, B, C, and E.

Follow-up examination (Choices A and B) and no immediate management (Choice E) would be inappropriate in a patient with signs of DDH on examination. It is imperative to diagnose and begin treatment for DDH, as earlier treatment increases success of reduction and decreases long-term complications of residual dysplasia. The use of triple diapers has not been shown to improve outcomes of DDH. Subluxation of the hip can present at birth and correct spontaneously, however, when subluxation persists beyond 2 weeks of age, further treatment is indicated.

X-rays of the hips (Choice C) would not be the preferred diagnostic study of choice in this patient as femoral heads do not ossify until four to six months of age, and ultrasonography is able to visualize the cartilaginous anatomy of the femoral head without exposing the child's pelvic soft tissues to radiation.

Educational Objective: DDH can present with limited hip range of motion, palpable hip instability, unequal leg lengths, and asymmetric thigh skinfolds. Diagnosis is made by ultrasonography.

40. A 72-year-old man is brought to the emergency department 20 minutes after collapsing at a local restaurant. He was waiting to get his coat when he passed out. He did not lose bowel or bladder control and was awake and oriented when the paramedics arrived. He has coronary artery disease and sustained a myocardial infarction 3 years ago. His current medications include enalapril, metoprolol, aspirin, and pravastatin. Examination shows no abnormalities. Laboratory studies, including measurement of cardiac enzyme activities, are within normal limits. A CT scan of the head shows no abnormalities. An ECG is shown. Which of the following is the most likely cause of this patient's symptoms?

A) Hyperkalemia
B) Premature atrial contractions that are aberrantly conducted
C) Premature junctional contractions that are aberrantly conducted
D) Subendocardial myocardial infarction
E) Ventricular tachycardia
F) Wolff-Parkinson-White syndrome

Correct Answer: E.

Ventricular tachycardia (VT) occurs when an abnormal electrical focus or a re-entry circuit causes rapid contraction of the ventricles. There are many criteria for defining VT on the ECG, but the general morphology will demonstrate a wide QRS complex tachycardia without identifiable P waves. Risk factors include underlying structural heart disease, history of coronary artery disease, or myocardial infarction. Non-sustained VT lasts for less than 30 seconds, while sustained VT persists longer than 30 seconds and presents with varying symptoms such as palpitations and syncope. While an episode of VT may be transient, if sustained, it may require treatment with anti-arrhythmic medications or cardioversion. Class I or III antiarrhythmics (eg, lidocaine, amiodarone) are the frequent first-line therapy for stable, sustained VT. Synchronized cardioversion may be necessary in cases of unstable, sustained VT, and defibrillation is required for pulseless VT. Syncope in the setting of VT typically persists for the duration of the episode.

Incorrect Answers: A, B, C, D, and F.

Hyperkalemia (Choice A) leads to reduced myocardial excitability resulting in repolarization abnormalities, conduction dysfunction, heart block, and bradycardia. These abnormalities can manifest on an ECG with peaked T waves, PR interval prolongation, loss of P waves, and if severe, widened QRS complexes, bradycardia, and cardiac arrest. Patients with end-stage kidney disease requiring dialysis are prone to electrolyte abnormalities, especially hyperkalemia.

Premature atrial contractions (PAC) (Choice B) occur when an electrical impulse is generated at a location in the atria outside the sinoatrial (SA) node. Premature junctional contractions (PJC) (Choice C) occur when an electrical impulse is generated within the atrioventricular (AV) junction. If a P wave is visualized, it will have an abnormal appearance. The impulse travels along the normal path through the AV node and the rest of the conduction system, so the QRS complex appears similar to the other sinus beats (narrow). There is always a compensatory pause following a PAC or PJC because the ectopic beat causes the SA node to become temporarily refractory.

Subendocardial myocardial infarction (Choice D) describes necrosis of the innermost aspect of the myocardium and classically appears on ECG as ST segment depression.

Wolff-Parkinson-White syndrome (Choice F) involves a structural defect in the His-Purkinje system resulting in atrioventricular reentrant tachycardia. Signs of Wolff-Parkinson-White syndrome on ECG include decreased PR interval and a delta wave (slurred upstroke of the QRS segment).

Educational Objective: VT occurs when an abnormal electrical focus or a re-entry circuit causes rapid contraction of the ventricles resulting in a wide QRS complex tachycardia.

41. A full-term 8-hour-old male newborn regurgitates his first feeding. He drools constantly and has not urinated or had a bowel movement. His pulse is 136/min, and respirations are 68/min. There are no intercostal retractions. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate initial diagnostic procedure?

A) Air-contrast study of the esophagus
B) pH study of the esophagus
C) Sweat chloride test
D) X-ray of the chest
E) Insertion of a radiopaque nasogastric tube

Correct Answer: E.

Newborns with esophageal atresia typically present with the inability to feed, with associated gagging and an inability to manage oral secretions. Esophageal atresia often occurs with a concomitant tracheoesophageal fistula (TEF). The presence of a TEF, depending on the subtype, potentially conveys an increased risk of aspiration pneumonia and respiratory distress. Initial evaluation requires an attempt at insertion of a nasogastric tube and evaluation of its position with a chest x-ray. If the nasogastric tube remains coiled within the esophagus, this suggests the presence of esophageal atresia. Air within the gastrointestinal tract immediately after birth and prior to feeding suggests the existence of a TEF distal to the esophageal atresia. Confirmation of the diagnosis requires esophagography with contrast. Definitive management requires surgical repair. Additional screening for associated congenital malformations should occur as esophageal atresia is associated with the VACTERL (vertebral, anal, cardiac, tracheal, esophageal, kidney, and limb) group of malformations and CHARGE (coloboma of the eye, heart anomaly, choanal atresia, retardation, and genital and ear anomalies) syndrome.

Incorrect Answers: A, B, C, and D.

Air-contrast studies of the esophagus (Choice A) are often paired with barium as a double contrast study in order to detect subtle abnormalities of the esophageal mucosa. Double contrast studies are not typically required for the diagnosis of TEF, which is more readily identified by insertion of a nasogastric tube in the appropriate clinical circumstance.

pH study of the esophagus (Choice B) is useful for the diagnosis of gastroesophageal reflux, which is unlikely to present with regurgitation of an infant's first feeding or with failure to pass stool.

Sweat chloride testing (Choice C) is useful for the diagnosis of cystic fibrosis. While cystic fibrosis causes thickened mucus and pancreatic insufficiency and may therefore present with constipation (eg, meconium ileus) or with greasy, foul-smelling stools, it does not typically present with regurgitation of the first feeding.

X-ray of the chest (Choice D) can be used to evaluate the position of the nasogastric tube after placement. If it remains coiled in the esophagus rather than proceeding to the stomach, it suggests the presence of esophageal atresia. A chest x-ray by itself, without attempt at nasogastric tube insertion, would not be sufficiently sensitive to suggest esophageal atresia or TEF.

Educational Objective: Esophageal atresia presents in a newborn with an inability to feed and manage oral secretions. If there is a concomitant tracheoesophageal fistula, the patient may present with gagging, coughing, respiratory distress, and cyanosis in the postpartum period. Inability to pass a nasogastric tube with coiling in the proximal esophagus on chest x-ray is suggestive, but esophagography with contrast confirms the diagnosis. Definitive management requires surgical repair.

42. A 47-year-old woman comes to the physician because of a 6-day history of frequent diarrhea associated with painful straining, abdominal cramps, and intermittent passage of bright red blood. Her symptoms began during a trip to Mexico. She is otherwise in good health and takes no medications. Her temperature is 38.2°C (100.7°F), pulse is 92/min, respirations are 18/min, and blood pressure is 130/75 mm Hg. There is mild lower abdominal tenderness without peritoneal signs. A scant amount of loose brown stool present in the rectal vault tests positive for occult blood. Which of the following is the most likely causal organism?

A) *Ascaris lumbricoides*
B) *Campylobacter jejuni*
C) *Cryptosporidium parvum*
D) *Giardia lamblia*
E) *Vibrio cholerae*

Correct Answer: B.

Campylobacter jejuni is a Gram-negative, non-spore-forming, oxidase positive, comma-shaped bacterium that is among the most common causes of food poisoning both in the United States and globally. Infection is transmitted via the fecal-oral route or from contact with infected animals or poorly cooked meats. Infection with *C. jejuni* results in gastroenteritis and presents with fever, cramping abdominal pain, and diarrhea, which may be loose or bloody. Symptoms are typically self-limiting and resolve over a period of approximately 1 week. Extraintestinal complications of *C. jejuni* infection include reactive arthritis in patients with HLA-B27 and Guillain-Barré syndrome. Most patients require supportive treatment and should not be prescribed antibiotics. Antibiotics may be necessary in patients with severe or protracted symptoms, immunocompromise, or pregnancy.

Incorrect Answers: A, C, D, and E.

Ascaris lumbricoides (Choice A) is a parasitic roundworm that causes ascariasis. Symptoms include abdominal pain and distension, vomiting, and borborygmi caused by small bowel obstruction. Pulmonary manifestations include cough and eosinophilic pneumonitis. It is not a common cause of traveler's diarrhea.

Cryptosporidium parvum (Choice C) causes cryptosporidiosis, a severe, often life-threatening illness in AIDS patients that is characterized by fever, watery diarrhea, and cramping abdominal pain. It is rare in travelers or immunocompetent hosts and if present, generally causes mild, self-resolving diarrhea.

Giardia lamblia (Choice D) is a flagellated, parasitic organism that causes giardiasis. It presents with persistent diarrhea that is foul-smelling and fatty, as well as abdominal pain, bloating, cramping, and weight loss as a result of small bowel parasitic overgrowth and the resultant malabsorption of fats and carbohydrates. It is commonly acquired as a result of ingestion of contaminated water, typically in rural areas or wilderness.

Vibrio cholera (Choice E) is a Gram-negative rod that causes cholera, a severe, acute watery diarrhea resulting in substantial dehydration. It is endemic to Africa, southeast Asia, Haiti, and India.

Educational Objective: *C. jejuni* is a Gram-negative bacterium that is one of the most common causes of infectious gastroenteritis. Infection results in fever, cramping abdominal pain, and diarrhea, which may be loose or bloody, and which resolves generally over the course of 1 week. Treatment is primarily supportive.

43. An 80-year-old woman is admitted to the hospital because of increasing somnolence over the past 2 days. Her pulse is 90/min while supine and 110/min while standing, respirations are 20/min, and blood pressure is 120/80 mm Hg while supine and 100/80 mm Hg while standing. Examination shows no abnormalities except for dry skin and mucous membranes. Laboratory studies show:

Serum	
Na^+	137 mEq/L
Cl^-	100 mEq/L
K^+	4.3 mEq/L
HCO_3^-	19 mEq/L
Urea nitrogen	30 mg/dL
Glucose	900 mg/dL
Creatinine	1.6 mg/dL
Arterial pH	7.38

Which of the following is the most appropriate initial therapy?

A) Intravenous bicarbonate
B) Intravenous insulin
C) Intravenous potassium
D) Intravenous 0.9% saline
E) Oral hypoglycemic agent

Correct Answer: D.

Nonketotic hyperosmolar state is a condition of severe hyperglycemia and increased serum osmolality resulting in profound dehydration, without the abnormal production of ketones. This typically occurs in patients with type 2 diabetes mellitus after an inciting stress event, such as an acute infection. The increased osmolality results in excessive osmotic diuresis, which leads to progressive, marked dehydration. Presenting symptoms include lethargy, thirst, polyuria, altered mental status, and potential coma and death if untreated. Laboratory studies typically show hyperglycemia (>500 mg/dL), and increased osmolality (>320 mOsm/kg) without acidosis because of the lack of ketone production. Orthostatic tachycardia and hypotension can be seen in cases of dehydration, such as in this patient, and are marked by positional tachycardia (an increase of at least 20 beats/minute) and hypotension (a decrease of at least 20 mm Hg systolic). Treatment requires aggressive fluid resuscitation with isotonic intravenous fluids, electrolyte correction, and if needed, insulin.

Incorrect Answers: A, B, C, and E.

Intravenous bicarbonate (Choice A) is occasionally indicated for patients with severe acidosis. This patient's bicarbonate is approximately normal, so she does not require sodium bicarbonate.

Administration of insulin (Choice B) is not the best first step as the primary cause of hyperglycemia in this case is dehydration. Administering insulin would be critical if the patient were demonstrating signs of diabetic ketoacidosis. However, she has a relatively normal serum bicarbonate and minimal anion gap at this time. Thus, addressing dehydration will likely resolve the hyperglycemia and should be the first step in management.

Intravenous potassium (Choice C) is not indicated at this time, as the potassium concentration is normal. In patients with diabetic ketoacidosis, total body potassium concentrations may be decreased and potassium may need to be given, but only when serum potassium concentration is less than 3.3 mEq/L.

Oral hypoglycemic agent (Choice E) is used in the outpatient treatment of diabetes and would not be helpful in this patient's acute presentation of hyperglycemia and hyperosmolar state.

Educational Objective: Nonketotic hyperosmolar state is a condition of severe hyperglycemia and increased serum osmolality resulting in profound dehydration, without the abnormal production of ketones. Initial treatment requires aggressive fluid resuscitation with isotonic intravenous fluids.

44. A 19-year-old man is brought to the emergency department by friends because of increasing agitation and confusion during the past 2 hours. On arrival, he is mute and unresponsive to questions. His friends say that he drinks alcohol heavily and uses various illicit drugs on the weekends. His temperature is 39.6°C (103.2°F), pulse is 130/min, and blood pressure is 144/92 mm Hg. He is diaphoretic and grinding his teeth. The pupils are 4 mm. Neurologic examination shows tremulousness and poor coordination of the upper and lower extremities. On mental status examination, he exhibits psychomotor agitation and glances about the room in a confused and anxious manner. The most likely diagnosis is intoxication with which of the following substances?

A) Alcohol
B) Alprazolam
C) Cannabis
D) Ecstasy (3,4-methylenedioxymethamphetamine)
E) Heroin
F) Nitrous oxide

Correct Answer: D.

Ecstasy (3,4-methylenedioxymethamphetamine), also known as “molly,” is a psychotherapeutic agent and drug of abuse. It is a stimulant and causes feelings of increased energy, euphoria, and disinhibition. Minor characteristic adverse effects include agitation, bruxism (grinding teeth), diaphoresis, and blurry vision. However, serious adverse effects also accompany ecstasy (3,4-methylenedioxymethamphetamine) use. Autonomic instability (hypertension, tachycardia, and hyperthermia) can lead to life threatening cardiovascular effects. Hyponatremia can also occur secondary to increased water intake and secretion of anti-diuretic hormone. Severe hyponatremia may be accompanied by seizures, as well as confusion, coma, or death. Treatment includes rapid administration of hypertonic saline if recurrent seizure activity occurs, followed by gradual correction of sodium and management of autonomic instability.

Incorrect Answers: A, B, C, E, and F

Alcohol (Choice A) and benzodiazepines (Choice B) are central nervous system depressants that, in toxic doses, can cause slurred speech, ataxia, gait instability, emotional lability, and memory lapses.

Cannabis (Choice C) is a hallucinogen that causes euphoria, paranoia, hallucinations, increased appetite, conjunctival injection, and cognitive slowing.

Heroin (Choice E) and other opiates are central nervous system depressants. Opiate intoxication causes sedation, bradycardia, hypotension, depressed respiratory drive, and constricted pupils.

Nitrous oxide (Choice F) is an inhalant that has effects on multiple organ systems: neuropsychiatric (headache, cognitive impairment, anosmia, cerebellar dysfunction, mood swings, irritability, hallucinations), dermatologic (perioral or perinasal dermatitis), otolaryngologic (nosebleeds, halitosis), ocular (conjunctival injection), cardiac (dysrhythmia, tachycardia), gastrointestinal (nausea, anorexia), and respiratory (wheezing, coughing, sneezing). Toxicity can manifest with tachydysrhythmias, respiratory depression, tremor, ataxia, and nystagmus, and, ultimately, seizures or coma.

Educational Objective: Ecstasy (3,4-methylenedioxymethamphetamine) causes both minor and serious adverse effects including autonomic instability, cardiovascular toxicity, and severe hyponatremia.

45. A 57-year-old man comes to the emergency department because of a 3-week history of constant, severe, nonradiating, midthoracic back pain. He has not had recent trauma to the area. Six weeks ago, he had an episode of *Staphylococcus aureus* sepsis that resolved with antibiotic therapy. He has end-stage renal disease secondary to hypertension treated with minoxidil and metoprolol; he also receives dialysis by way of tunnel dialysis catheter. His temperature is 37.8°C (100°F), and blood pressure is 140/88 mm Hg. Examination shows tenderness to palpation over T7 and T8. Laboratory studies show an erythrocyte sedimentation rate of 50 mm/h. A T1-weighted MRI of the spine shows decreased signal intensity in the vertebral bodies of T7 and T8 and no abnormalities in the epidural space. In addition to changing the patient's hemodialysis catheter, which of the following is the most appropriate next step in management?

A) DEXA scan
B) Intravenous antibiotic therapy
C) Oral benzodiazepine therapy
D) Oral nonsteroidal anti-inflammatory drug therapy
E) Physical therapy
F) Spinal traction
G) Surgical intervention

Correct Answer: B.

Osteomyelitis is an infection of bone and bone marrow, and typically presents acutely, subacutely, or chronically from direct inoculation or hematogenous spread from a distal site. Risk factors include traumatic inoculating injury, diabetes mellitus, peripheral vascular disease, intravenous drug use, and prosthetic devices or indwelling hardware. In adults, it most commonly occurs from direct spread from an adjacent soft tissue infection, and less likely from hematogenous seeding of bacteria to that site. In children, intravenous drug users, and patients receiving dialysis with indwelling lines such as tunneled catheters, hematogenous seeding is more common given the propensity for bacteremia and distant seeding of the bacteria to the involved site. Patients typically complain of pain, difficulty bearing weight, and overlying tenderness to palpation. Laboratory studies may show leukocytosis and increased inflammatory markers. On imaging, osteomyelitis can present with localized osseous erosive changes of the bone and if vertebral and associated with discitis, with collapse of the disc space. Treatment of osteomyelitis involves urgent intravenous antibiotic therapy.

Incorrect Answers: A, C, D, E, F, and G.

The diagnosis of osteoporosis is made based on a DEXA scan (Choice A) once the bone mineral density falls below 2.5 standard deviations of the mean for a young adult. Osteoporosis occurs as a result of the loss of bone mineral density, and the condition is often asymptomatic until a traumatic injury results in a fracture, most commonly involving the hip, distal radius, or vertebrae. It would not be associated with fever or increased inflammatory markers.

Oral benzodiazepine therapy (Choice C) can be used for anxiety disorders. Benzodiazepines activate γ-aminobutyric acid receptors in the amygdala, decreasing neuronal action potentials and attenuating the fear response.

Oral nonsteroidal anti-inflammatory drug therapy (Choice D) and physical therapy (Choice E) can be helpful in the treatment of thoracic or lumbar muscular strain or arthritis. However, this patient has midline, not paraspinal, thoracic tenderness and imaging concerning for vertebral osteomyelitis, making muscular strain less likely.

Spinal traction (Choice F) is a treatment option for herniated discs and involves the application of a longitudinal force to decrease pressure on compressed vertebral discs. Disc herniation occurs often occurs following chronic disc degeneration combined with a minor traumatic event such as bending and lifting a heavy object causing an acute increase in the intradiscal pressure. Acute disc herniation presents as back pain along with extremity pain or weakness in a dermatomal and myotomal distribution with respect to the impinged spinal nerve.

Surgical intervention (Choice G) is indicated in the setting of osteomyelitis if it is associated with neurologic deficits, the presence of an epidural or paravertebral abscess, cord compression caused by vertebral collapse, or persistent disease despite antibiotic therapy for source control. The most appropriate next step in this patient's case involves antibiotic therapy, with surgical therapy only if there is failure of antibiotic therapy or other associated complications.

Educational Objective: Osteomyelitis is an infection of the bone or bone marrow that may be caused by direct local spread of an infection or hematogenous seeding from a distal site. Patients present with fever, localized pain and inflammation, and increased inflammatory markers. Treatment of osteomyelitis involves urgent intravenous antibiotic therapy.

46. An 18-month-old girl is brought to the physician because she has not used her right arm since falling while running hand-in-hand with her older sister 2 hours ago. She holds her right arm at her side with the forearm pronated; she is unable to fully supinate or flex her forearm. There is no obvious swelling or point tenderness. Which of the following is the most appropriate initial management?

A) Rest, ice, and elevation of the elbow
B) Supination of the forearm
C) Use of a sling and swathe
D) Application of a figure-of-8 strap
E) Application of a posterior splint

Correct Answer: B.

Dislocation or subluxation of the radial head is a common pediatric injury, known as a nursemaid elbow. It results from traction on the radial head, which displaces it from within its ligamentous annulus. This most often occurs in children of age 12 to 36 months, and often arises from defensive maneuvers by parents or caretakers when grabbing the child's arm to prevent running into traffic or similarly endangering oneself. It can also arise from routine play if a parent, older sibling, or caregiver is swinging the child by his or her arms. Sometimes a pop may be heard, or clunk may be felt, usually followed by immediate crying. Children are generally consolable following the injury, and they often present with the arm held in a neutral, extended, pronated position as this is generally the position of best comfort. They will generally grimace or cry with palpation of the radial head. Diagnosis is clinical, and x-rays are seldom necessary; even if performed, they may not show misalignment as this is a ligamentous injury and pediatric ossification of the elbow occurs between ages 2 to 12 years making the structures poorly visible on x-ray. Treatment involves reducing the radial head back into the annulus through physical manipulation by hyper-pronation, or supination-flexion maneuvers, or both. Seldom is operative reduction necessary, nor is sedation to achieve appropriate reduction. A successful reduction is determined by the child reusing his or her arm. Recurrent injuries are common.

Incorrect Answers: A, C, D, and E.

Rest, ice, and elevation of the elbow (Choice A) would be helpful in cases of strain or fracture. However, after successful reduction of radial head subluxation, function of the elbow returns to normal.

Use of a sling and swathe (Choice C) is indicated for shoulder immobilization such as after a clavicular fracture, proximal humerus fracture, or shoulder dislocation.

Application of a figure-of-8 strap (Choice D) is used after clavicular fractures. This patient's primary injury is radial head subluxation and this would not be indicated.

Application of a posterior splint (Choice E) is used in the case of supracondylar humerus fractures at the elbow. This patient's radial head subluxation can be reduced with a prompt return of function and immobilization is not necessary.

Educational Objective: Dislocation or subluxation of the radial head is a common pediatric injury, known as a nursemaid elbow. It results from traction on the radial head, which displaces it from within its ligamentous annulus. Diagnosis is clinical, and generally, bedside reduction without sedation or analgesia is feasible with patients typically demonstrating a prompt return of function.

47. A 42-year-old man comes for a routine health maintenance examination. There is no family history of coronary artery disease, and he does not smoke. His weight is appropriate for his height. His blood pressure is 120/80 mm Hg. Serum lipid studies show a total cholesterol concentration of 190 mg/dL, HDL-cholesterol concentration of 40 mg/dL, and triglyceride concentration of 150 mg/dL. Which of the following is the most appropriate next step in management?

A) Recommend the Step 2 National Cholesterol Education Program diet

B) Measure serum LDL-cholesterol concentration now

C) Measure total serum cholesterol concentration in 5 years

D) Prescribe prophylactic aspirin

E) Begin treatment with lovastatin

Correct Answer: C.

Measuring total serum cholesterol concentration in 5 years is the next step in management of this otherwise healthy 42-year-old man. The American College of Physicians recommends that cholesterol concentration should be assessed in asymptomatic men over the age of 35 and asymptomatic women over the age of 40 to 45. For patients between the ages of 40 and 75 with no history of cardiovascular disease, utilization of the atherosclerotic cardiovascular disease (ASCVD) risk calculator can be helpful in determining the benefit of adding a statin medication to lower cholesterol concentrations. The ASCVD calculator provides an estimate as to the probability that the patient will experience a stroke or a myocardial infarction in the next 10 years based upon age, smoking status, race, blood pressure, and cholesterol concentration. A risk of less than 5% does not require intervention while a risk over 7.5% meets criteria for the use of statin medication. A risk between 5-7.5% requires a discussion between the patient and provider about the risks and benefits of statin therapy.

Incorrect Answers: A, B, D, and E.

Recommend the Step 2 National Cholesterol Education Program diet (Choice A) is incorrect. This diet was previously recommended to some patients with hypercholesterolemia but is not indicated for patients with relatively normal cholesterol concentrations.

Measuring serum LDL-cholesterol concentration now (Choice B) can be considered in some cases, although only the HDL and total cholesterol are required to assess cardiovascular risk.

Prescribe prophylactic aspirin (Choice D) is incorrect. Recent studies have demonstrated that healthy patients without a history of cardiovascular disease or diabetes do not receive any mortality benefit from the use of prophylactic aspirin. Even based on prior studies and guidelines, initiation of aspirin therapy generally does not begin until a patient is 45-55 years of age.

Begin treatment with lovastatin (Choice E) is incorrect. This patient does not meet criteria for the use of a statin medication.

Educational Objective: While variation exists in clinical practice, most asymptomatic men over the age of 35 and women over the age of 40 to 45 should be screened for hyperlipidemia. In those without other risk factors such as smoking, hypertension, or a family history of early myocardial infarction and normal cholesterol concentrations, repeat screening should be completed every 3 to 5 years.

48. A 47-year-old man is brought to the emergency department 20 minutes after being involved in a head-on motor vehicle collision. He was an unrestrained passenger of a car traveling at 30 mph. At the scene, he was conscious and followed commands. His pulse was 110/min, and blood pressure was 90/55 mm Hg. En route to the hospital, he was resuscitated with 1 L of crystalloid solution. On arrival, he is alert and oriented to person, place, and time. He has shortness of breath and chest pain. A nasogastric tube is inserted. His blood pressure is 130/70 mm Hg. Examination shows abrasions over the left anterior hemithorax. The lungs are clear to auscultation. Heart sounds are normal. Abdominal examination shows no abnormalities. A portable x-ray of the chest shows fluid at the base of the left lung field and a fluid density at the left pleural apex. The nasogastric tube is deviated to the right in the upper mediastinal region. His blood pressure suddenly decreases to 80/40 mm Hg. Which of the following is the most likely cause of this patient's hypotension?

A) Aortic transection
B) Cardiac contusion
C) Liver laceration
D) Pericardial tamponade
E) Spinal shock

Correct Answer: A.

Traumatic transection of the aorta can occur in penetrating trauma or in deceleration injuries such as motor vehicle collisions or falls. It typically causes near-immediate fatality as a result of massive hemorrhage from the aorta and patients often die prior to receiving medical attention. Patients who do survive can present with hypotension, hemodynamic instability, chest pain, and a left hemothorax. The most common site for tearing of the aorta is at the proximal descending aorta, at which the ligamentum arteriosum creates a site vulnerable to shearing forces during sudden deceleration. The gold standard of diagnosis involves a CT angiography of the aorta; however, hypotensive patients may be too unstable to tolerate a CT scan. A chest x-ray can be obtained which may show a widened mediastinum, left hemothorax, an apical cap, or rightward displacement of the trachea or nasogastric tube if placed. Repair of traumatic transection of the aorta can be done via open repair or endovascular repair.

Incorrect Answers: B, C, D, and E.

Cardiac contusion (Choice B) is a potential complication of blunt chest trauma. It is often evidenced by external signs of chest trauma such as bruising, rib fractures, or sternal fractures. X-ray is generally normal. ECG abnormalities may be present and increased cardiac biomarkers would be expected on laboratory evaluation.

Traumatic injury to the liver such as a liver laceration (Choice C) could present with abdominal pain and peritonitis because of blood causing irritation and inflammation of the peritoneum. However, it would not cause hemothorax.

Pericardial tamponade (Choice D) presents with hypotension, shortness of breath, distant heart sounds, jugular venous distention, and pulsus paradoxus. It occurs following accumulation of either a large volume or rapid-onset pericardial effusion. Rapid decompression of the pericardial space is required to prevent ongoing shock.

Spinal shock (Choice E) occurs following spinal cord injury or transection and results in loss of sensation and motor paralysis below the level of the injury, with an initial loss but gradual recovery of function.

Educational Objective: Traumatic transection of the aorta can occur in penetrating trauma or in deceleration injuries such as motor vehicle collisions or falls. A chest x-ray may show a widened mediastinum, left hemothorax, an apical cap, or rightward displacement of the trachea or nasogastric tube.

49. An 18-year-old woman comes to the physician because of intermittent vaginal bleeding and abdominal pain over the past 4 days. Menses occur at irregular 28- to 40-day intervals. She cannot remember the date of her last menstrual period. She is sexually active with one partner, and they use condoms for contraception. Pelvic examination shows normal external genitalia and a normal-appearing cervix. There is blood coming from the cervical os. The uterus is slightly enlarged. Serum β-hCG concentration is 7000 mIU/mL. Pelvic ultrasonography shows a small amount of fluid in the uterus only but no evidence of a gestational sac. Which of the following is the most likely diagnosis?

- A) Ectopic pregnancy
- B) Endometrial polyp
- C) Endometritis
- D) Granulosa cell tumor
- E) Hydatidiform mole
- F) Leiomyomata uteri
- G) Normal pregnancy

Correct Answer: A.

Pregnancy is suspected when there is a missed or delayed menstrual period, and ectopic pregnancy often presents with vaginal bleeding and abdominopelvic pain. Serum β-hCG is produced by the placenta, is undetectable in non-gravid patients, and doubles approximately every 48 hours during an early normal pregnancy. Ectopic pregnancy is an abnormal pregnancy in which the fertilized ovum implants in the fallopian tube (most common), on the ovary, within the peritoneal cavity, or in any non-endometrial location. β-hCG concentration do not increase as expected in ectopic pregnancy, often lagging the normal expected doubling. Ultrasonography can be used to assess for an intrauterine pregnancy and may visualize an ectopic pregnancy; in a normal pregnancy, an intrauterine gestational sac should be visible by approximately 5 weeks gestational age. Additionally, transvaginal ultrasound provides sufficient sensitivity to detect an intrauterine pregnancy once the β-hCG concentration generally exceeds 1000 to 2000 mIU/mL. An ectopic pregnancy is not viable. Treatment of an ectopic pregnancy can be medical with methotrexate for small, early pregnancies, but may require salpingectomy or evacuation with laparoscopy for larger pregnancies, in cases of medical treatment failure, or when ruptured. Complications of ectopic pregnancy include rupture, bleeding, and hemoperitoneum.

Incorrect Answers: B, C, D, E, F, and G.

Endometrial polyps (Choice B) can cause abnormal uterine bleeding, commonly intermenstrual. Ultrasonography may identify the polyp, although evaluation with sonohysterography may be required. Polyps do not frequently cause abdominal pain and would not cause increased β-hCG concentration.

Endometritis (Choice C) is caused by an ascending polymicrobial infection that infects the endometrial lining of the uterus. It presents with fever, uterine tenderness, and mucopurulent discharge, often in a postpartum patient. This patient does not have fever or uterine tenderness, making endometritis less likely.

Granulosa cell tumors (Choice D) are ovarian tumors that present with abdominal pain or pelvic fullness, abnormal uterine bleeding, and signs of estrogen or androgen excess. These tumors are typically seen on ultrasonography of the pelvis as ovarian masses.

Hydatidiform moles (Choice E) are caused by abnormal fertilization and often present with vaginal bleeding, an enlarged uterus, and early preeclampsia. They are not viable. Ultrasonography often shows bilateral multilocular ovarian cysts (theca lutein cysts) and abnormal echogenicity in the uterus. This patient with an empty uterus on ultrasonography and an increased β-hCG concentration is more likely experiencing an ectopic pregnancy.

Leiomyomata uteri (Choice F) are benign lesions of the myometrium. They often present in middle-age patients with abnormal uterine bleeding, pelvic pain or pressure, and an enlarged uterus with irregular contour on physical examination. They would be evident on ultrasonography.

Normal pregnancy (Choice G) can present with abdominal pain, vaginal bleeding, and an increased β-hCG concentration. However, a gestational sac in the uterus would be expected on ultrasonography once the β-hCG concentration exceeds 1000 to 2000 mIU/mL.

Educational Objective: Ectopic pregnancy occurs when a fertilized ovum implants outside of the endometrial cavity, most commonly within the fallopian tube. It presents with abdominopelvic pain, vaginal bleeding, and an increased β-hCG concentration, often relatively early in pregnancy given the limited area for fetal development and growth. Evaluation includes pelvic ultrasonography, which will fail to show a gestational sac in the uterus.

50. A 25-year-old primigravid woman at 27 weeks' gestation is brought to the emergency department because of severe contractions for 6 hours. She says the contractions have not resolved despite changing positions and increasing her fluid intake. She also noted a small amount of vaginal spotting the last time she voided. External fetal monitoring shows contractions every 2 to 3 minutes and a fetal heart rate of 130/min with no decelerations. The cervix is 1 cm dilated and 10% effaced. The fetal presenting part is high. During the next hour, she receives oral hydration. Her temperature is 37.2°C (99°F), pulse is 110/min, respirations are 16/min, and blood pressure is 110/70 mm Hg. The lungs are clear to auscultation. The fundal height is 27 cm. The cervix is now 1 to 2 cm dilated and 70% effaced; the vertex is at −2 station. Vaginal culture for group B streptococcus is positive. Which of the following is the most appropriate next step in management?

A) Observation only
B) Oral amoxicillin prophylaxis
C) Intramuscular administration of betamethasone
D) Cervical cerclage
E) Cesarean delivery

Correct Answer: C.

Preterm labor occurs after 20 and before 37 weeks' gestation. Patients in preterm labor usually present with irregular, mild contractions, pressure in the pelvis, and vaginal discharge or spotting. However, the contractions often progress to become severe and regular, causing cervical dilation. Risk factors for preterm labor include the extremes of reproductive age, a short interpregnancy interval, multiple gestations, fetal abnormalities, poly- or oligohydramnios, maternal substance use, uterine infection, and preeclampsia, among others. Evaluation includes the assessment of maternal and fetal vital signs, a speculum examination to determine whether the amniotic membrane has ruptured, and a digital cervical examination to assess cervical dilatation and effacement. Ultrasonography may also be performed to evaluate amniotic fluid volume and fetal positioning, in addition to testing for group B streptococcus (GBS), bacteriuria, drug use, and sexually transmitted infections. The risk to fetal survival is greater the earlier preterm labor occurs, with complications including respiratory distress, bronchopulmonary dysplasia, retinopathy of prematurity, intraventricular hemorrhage, neurodevelopmental delay, and a propensity for infections. Therefore, for patients at less than 34 weeks' gestation, treatment includes a course of betamethasone to increase fetal lung maturity, tocolytics to delay delivery, magnesium for fetal neuroprotection, and prophylactic antibiotics against GBS.

Incorrect Answers: A, B, D, and E.

Observation only (Choice A) would be inappropriate, as this patient is in active preterm labor and will likely deliver her newborn soon without intervention. A fetus at 27 weeks' gestation has a high likelihood of increased morbidity and mortality, particularly as a result of lung immaturity, and this patient should receive betamethasone prior to delivery.

Oral amoxicillin prophylaxis (Choice B) would not be the appropriate choice for the treatment of this patient's GBS colonization. Intravenous ampicillin is the recommended agent for this purpose, as oral medications have altered and inconsistent absorption in actively laboring women. Additionally, intravenous antibiotics allow a higher plasma concentration to be obtained so that the antibiotic can reach the placenta and fetus.

Cervical cerclage (Choice D) is used in the treatment of cervical insufficiency. It is usually placed early in pregnancy (12 to 23 weeks' gestation) in women that have a history of cervical incompetence or an examination consistent with cervical shortening. It is contraindicated in active preterm labor.

Cesarean delivery (Choice E) is not necessary at this time. This patient and her fetus show no signs of clinical distress, and her labor is progressing appropriately, despite being preterm. Treating this patient with betamethasone and tocolytics allows for improved fetal lung maturity, which would not occur if the patient were to undergo cesarean delivery.

Educational Objective: Preterm labor occurs between 20 and 37 weeks' gestation with the onset of contractions associated with cervical dilation and effacement. Because premature birth is accompanied by significant fetal morbidity and mortality, treatment often aims at delaying delivery. In particular, for patients under 34 weeks' gestation, a course of betamethasone is administered to enhance fetal lung maturity, which is accompanied by tocolytics to try to delay delivery. Magnesium is also given for fetal neuroprotection.

1. A 1-year-old boy is brought to the physician 24 hours after the onset of lethargy. He has a 2-day history of fever, vomiting, and decreased appetite. He was recently adopted from Russia. He attends day care five times weekly. His temperature is 39.4°C (103°F). Examination shows neck stiffness and decreased skin turgor. Which of the following vaccines is most likely to have prevented this patient's condition?

A) Diphtheria-tetanus-acellular pertussis
B) *Haemophilus influenzae* type b
C) Hepatitis A
D) Hepatitis B
E) Inactivated poliovirus
F) Influenza virus
G) Measles-mumps-rubella

Correct Answer: B.

Haemophilus influenzae type b (Hib) immunization would most likely have prevented this patient's current illness, which is most consistent with meningitis. Hib causes a variety of infections in unvaccinated children and immunocompromised adults including meningitis, otitis media, pneumonia, epiglottitis, and bacteremia among others. The Centers for Disease Control recommends immunization with either a two or three dose series starting as early as 6 weeks of age. An additional booster vaccine is given between the age of 12 and 15 months. Patients who have immigrated or who have been adopted from other countries should have their vaccination status confirmed by a pediatrician and catch-up vaccination should be given as indicated.

Incorrect Answers: A, C, D, E, F, and G.

Diphtheria-tetanus-acellular pertussis (DTaP) (Choice A) vaccine is also recommended for patients who have not previously received the vaccine, but this patient's illness is not consistent with diphtheria, tetanus, or pertussis.

Hepatitis A (Choice C) causes jaundice, hepatomegaly, and nausea and vomiting. This patient's presentation is not consistent with this disease. Similarly, hepatitis B (Choice D) is a common cause of acute and chronic liver disease throughout the world. This patient should receive vaccination to protect against hepatitis, but his clinical presentation is not suggestive of this infection.

Inactivated poliovirus (Choice E) vaccine is indicated for all children, but this patient's illness is not consistent with polio.

Influenza virus (Choice F) vaccination is indicated for all children without contraindications on a yearly basis. While influenza can cause viral or aseptic meningitis, Hib is the more likely culprit in this unvaccinated patient who attends daycare frequently.

Measles-mumps-rubella (Choice G) vaccine is only indicated for patients starting at the ages of 12 to 15 months. Earlier vaccination is not recommended. Additionally, his presentation is not consistent with measles, mumps, or rubella.

Educational Objective: Hib vaccination is indicated for all children over the age of 6 weeks and has been shown to substantially reduce the incidence of invasive *H. influenzae* infections, including meningitis. Patients who have not been vaccinated should receive catch-up vaccinations.

2. A 4-year-old girl is brought to the physician because of cough and a 2.3-kg (5-lb) weight loss during the past 2 months. There is no history of serious illness, and she takes no medications. Immunizations are up-to-date. She is at the 50th percentile for height and 25th percentile for weight. Occasional crackles are heard over the right middle lung field. Intradermal skin testing with PPD, tetanus toxoid, and antigens for *Candida albicans* and *Trichophyton tonsurans* is nonreactive at 72 hours. Her leukocyte count is 5100/mm^3. Nucleic acid hybridization testing of gastric aspirates shows *Mycobacterium tuberculosis*. Which of the following is the most likely explanation for this patient's findings?

A) Antibody deficiency
B) Complement deficiency
C) Impaired chemotaxis
D) Impaired respiratory burst
E) Neutropenia
F) Splenic dysfunction
G) T-lymphocyte dysfunction

Correct Answer: G.

T-lymphocyte dysfunction is the most likely explanation of this patient's failure to thrive and gastric aspirate demonstrating *Mycobacterium tuberculosis* (MTB) infection in the absence of a positive PPD skin test. T-lymphocyte dysfunction is typical of a variety of immunodeficiency syndromes and may be genetic or acquired. Severe combined immunodeficiency syndrome (SCID) may result from a variety of genetic defects and causes a near complete deficiency of T lymphocytes. Bare lymphocyte syndrome results in normal numbers of T lymphocytes, but the absence of human leukocyte antigen-DR (HLA-DR) molecules on the surface of lymphocytes renders these cells ineffective. Acquired causes include HIV/AIDS infection, which causes the CD4+ T-lymphocyte count to drop precipitously if untreated. Regardless of the cause, the presence of an abnormal population of T lymphocytes, or a deficiency in the number or function of cells, predisposes to infection with a variety of organisms. For example, fungal infections as a result of *Candida* species, *Pneumocystis jiroveci*, and *Cryptococcus* species are characteristic of T-lymphocyte deficiency. MTB infection is commonly seen.

Incorrect Answers: A, B, C, D, E, and F.

Antibody deficiency (Choice A), such as in X-linked agammaglobulinemia, results in impaired humoral immunity and often presents with recurrent sinopulmonary infections. Patients are susceptible to infection with bacteria, viruses, and fungi.

Complement deficiency (Choice B) predisposes to recurrent infection with *Neisseria* species.

Impaired chemotaxis (Choice C) of neutrophils occurs in Chédiak-Higashi syndrome, which presents with albinism, peripheral neuropathy, and recurrent pyogenic infections.

Impaired respiratory burst (Choice D) is characteristic of chronic granulomatous disease, which results from NADPH oxidase deficiency. The disease predisposes to infection with organisms such as *Staphyloccocus aureus* but does not predispose to infection with MTB.

Neutropenia (Choice E) may be congenital or acquired as a result of chemotherapy or exposure to myelotoxic agents. Neutropenia predisposes to infection with a variety of pathogenic bacteria and fungal organisms.

Splenic dysfunction (Choice F) predisposes to infection with encapsulated bacteria such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Neisseria meningitidis*, among others, but not to MTB infection.

Educational Objective: T-lymphocyte dysfunction can be genetic or acquired and increases the risk for MTB infection in addition to infection with a wide range of pathogens, particularly fungal organisms.

3. An asymptomatic 27-year-old man comes to the physician 1 month after he received the diagnosis of HIV infection. He takes no medications. He has been sexually active with multiple male partners. Examination shows no abnormalities. Laboratory studies show:

CD4+ T-lymphocyte count	479/mm^3 (Normal≥500)
Serum	
Cytomegalovirus (CMV) antibody	negative
Hepatitis B surface antibody	negative
Hepatitis C antibody	negative
Toxoplasma gondii antibody	negative
Plasma HIV viral load	2000 copies/mL

Which of the following is the most appropriate pharmacotherapy during the next year?

A) Influenza virus and 23-valent pneumococcal vaccines

B) Influenza virus and 23-valent pneumococcal vaccines and CMV prophylaxis

C) Influenza virus vaccine and *T. gondii* prophylaxis

D) Influenza virus, 23-valent pneumococcal, and hepatitis B vaccines

E) Prophylaxis for *Pneumocystis jirovecii* pneumonia and *T. gondii*

Correct Answer: D.

Influenza virus, 23-valent pneumococcal (PPSV23), and hepatitis B vaccines are all indicated in this patient with newly diagnosed HIV infection. PPSV23 and the pneumococcal 13-valent conjugate vaccine (PCV13) are both indicated in patients with HIV infection to protect against various strains of *Streptococcus pneumoniae*. The PCV13 vaccine is typically given first followed by the PPSV23 vaccine after an interval of time has passed. This patient also does not have evidence of immunity to hepatitis B as his hepatitis B surface antibody is negative. As such, he should receive a series of hepatitis B vaccines. Finally, yearly influenza vaccination is recommended in all patients, not just those living with HIV infection, and should be given before the start of the flu season. Additional vaccines, including the meningococcal vaccine, can be considered for certain patients with HIV infection, including men who have sex with men and live in larger urban areas.

Incorrect Answers: A, B, C, and E.

Influenza virus and PPSV23 vaccine (Choice A) are both indicated, but this patient should also receive the hepatitis B vaccine. CMV prophylaxis (Choice B) is rarely if ever indicated even in patients with advanced AIDS, though it is a known opportunistic infection at lower CD4 counts.

Influenza virus vaccine and *T. gondii* prophylaxis (Choice C) is incorrect. Prophylaxis against *T. gondii*, a spirochete that can reactivate in susceptible hosts, is only indicated in patients with positive antibodies (indicating prior exposure and potentially latent infection) and CD4 counts less than 100/mm^3.

Prophylaxis for *Pneumocystis jirovecii* pneumonia and *T. gondii* (Choice E) is incorrect. Prophylaxis for *P. jirovecii* is only indicated in patients with CD4 counts less than 200/mm^3.

Educational Objective: Patients with newly diagnosed HIV infection should receive the yearly influenza vaccine in addition to both pneumococcal vaccines. Patients who are not immune to hepatitis B, as evidence by a negative hepatitis B surface antibody, should receive a series of hepatitis B vaccines.

4. A 24-year-old woman with sickle cell disease is admitted to the hospital for management of severe abdominal pain and diffuse muscle and bone pain of the arms and legs associated with a sickle cell crisis. Her pain is similar to that of her previous crises. Her medications are acetaminophen-hydrocodone and folic acid supplementation. She appears to be in moderate discomfort. Her temperature is 36.7°C (98.1°F), pulse is 94/min, respirations are 22/min, and blood pressure is 116/68 mm Hg. The abdomen is diffusely tender; there is no guarding or rebound. The remainder of the examination shows no abnormalities. Her hemoglobin concentration is 6.8 g/dL, and leukocyte count is 14,000/mm^3. Pulse oximetry on room air shows an oxygen saturation of 94%. Administration of intravenous fluids and hydromorphone is begun. Which of the following is the most appropriate next step in management?

A) Oral administration of hydroxyurea

B) Oxygen supplementation by nasal cannula

C) Subcutaneous administration of erythropoietin

D) Intravenous administration of heparin

E) Intravenous administration of piperacillin

Correct Answer: B.

Oxygen supplementation by nasal cannula is the most appropriate next step in management of this patient with sickle cell crisis and an oxygen saturation of 94%. Patients with sickle cell crisis may develop pain secondary to vaso-occlusive events in nearly any part of the body. Pediatric patients tend to present with abdominal pain and dactylitis while older patients may develop diffuse pain in the arms and the legs. Treatment should focus on aggressive management of pain with the use of opiate and non-opiate medications and reversing any cause that may have triggered the pain crisis (eg, infection, acidosis, volume depletion). Patients with pain crises often respond to the administration of fluids as well as analgesics. It is important to recognize that a decreased oxygen saturation can portend the development of acute chest syndrome, which can be life- threatening and results in rapid and profound hypoxemia with pulmonary infiltrates. Thus, borderline hypoxia should be treated aggressively with the use of supplemental oxygen. Patients with frequent pain episodes should be considered for the use of hydroxyurea.

Incorrect Answers: A, C, D, and E.

Oral administration of hydroxyurea (Choice A) is appropriate prophylactic therapy for patients with frequent pain crises but is not helpful in the acute setting.

Subcutaneous administration of erythropoietin (Choice C) is not an appropriate intervention for this patient. This patient is likely to demonstrate a high number of reticulocytes on peripheral smear indicating a robust bone marrow response to anemia.

Intravenous administration of heparin (Choice D) would be appropriate for this patient if there was concern for a deep venous thrombosis or pulmonary embolism, but this patient's presentation is more consistent with an acute pain crisis.

Intravenous administration of piperacillin (Choice E) is not necessary at this time. In patients who develop acute chest syndrome, antibiotics are often given as it can be difficult to discern between acute chest syndrome and bacterial pneumonia.

Educational Objective: Patients with sickle cell disease may develop acute pain as a result of vaso-occlusive events, which may occur anywhere in the body. Treatment should focus on adequate pain management, hydration, and maintaining appropriate oxygenation. Patients with impending or frank hypoxia should be placed on supplemental oxygen and assessed for the presence of acute chest syndrome.

5. A 62-year-old man comes to the physician because he has been "slowing down" during the past 6 months. He has noticed that his gait is slower, he has difficulty rising from a chair, and his handwriting is smaller. He has a history of type 2 diabetes mellitus, insomnia, gastroparesis, hypertension, and hyperlipidemia. Medications are metformin, metoclopramide, lisinopril, atorvastatin, and zolpidem. His blood pressure is 140/80 mm Hg; other vital signs are within normal limits. During the examination, there is decreased facial expression and reduced eye blinking. Tone is increased in the axial and limb muscles. Muscle strength is 5/5 throughout, and deep tendon reflexes are 1+ bilaterally. Sensation to vibration is decreased over the toes bilaterally. His gait is shuffling, and there is decreased arm swing. Which of the following medications is most likely worsening this patient's neurologic condition?

A) Atorvastatin
B) Lisinopril
C) Metformin
D) Metoclopramide
E) Zolpidem

Correct Answer: D.

Metoclopramide is a dopamine-2 (D_2) receptor antagonist and muscarinic receptor agonist utilized for the treatment of nausea and gastroparesis. Metoclopramide targets nausea via central and peripheral D_2 antagonism. D_2 antagonism in the basal ganglia can cause extrapyramidal symptoms such as acute dystonic reaction, akathisia, parkinsonism, and tardive dyskinesia. Parkinsonism manifests with muscle rigidity, bradykinesia (presenting as masked facies, micrographia, slow gait, and decreased arm swing in this patient), resting tremor, and postural instability (presenting as a shuffling gait in this patient). Management of medication-induced parkinsonism typically involves discontinuing the offending agent or, if discontinuing the offending agent is inadvisable because of medical necessity, adding an anticholinergic medication such as benztropine, which counteracts antidopaminergic activity and addresses parkinsonism.

Incorrect Answers: A, B, C, and E.

Atorvastatin (Choice A) is a statin medication that inhibits the synthesis of cholesterol and is utilized for hyperlipidemia and cardioprotection. Lisinopril (Choice B) is an ACE inhibitor utilized for hypertension. Metformin (Choice C) decreases hepatic glucose production and improves insulin sensitivity and is utilized to treat type 2 diabetes. Zolpidem (Choice E) is a non-benzodiazepine sedative-hypnotic medication that is utilized for insomnia. None of these medications interact with dopamine neurotransmission and would therefore not affect this patient's movement.

Educational Objective: Metoclopramide is a dopamine-2 receptor antagonist utilized for the treatment of nausea and gastroparesis. Metoclopramide may cause parkinsonism. Parkinsonism manifests with muscle rigidity, bradykinesia, resting tremor, and/or postural instability.

6. A 13-year-old girl with neurofibromatosis 2 is brought to the office for a follow-up examination. She feels well. Vital signs are within normal limits. Physical examination shows no abnormalities. In addition to audiometry, which of the following is most appropriate to include in the annual screening of this patient?

A) Dilated eye examination
B) ECG
C) MRI of the brain
D) Skin examination
E) Visual evoked potential testing

Correct Answer: C.

Neurofibromatosis type 2 (NF2) is a genetically inherited disorder caused by a defect in *NF2*, a gene on chromosome 22 that encodes merlin (schwannomin), a tumor suppressor. It follows an autosomal dominant pattern of inheritance. It is characterized by a constellation of findings: bilateral acoustic schwannomas, cataracts, meningiomas, and ependymomas. Cutaneous findings include numerous subcutaneous tumors, more often schwannomas than neurofibromas. Unlike neurofibromatosis type 1, it is not associated with multiple endocrine neoplasia (MEN) syndromes. Routine surveillance for patients with NF2 is needed to monitor for the development of new tumors and growth of existing tumors. Along with annual audiometry, an annual brain MRI is recommended beginning at the age of 10 years old given the high rate of intracranial neoplasms in this condition.

Incorrect Answers: A, B, D, and E.

Dilated eye examination (Choice A) and visual evoked potential testing (Choice E) are not necessary to perform annually. Each patient with a confirmed diagnosis of NF2 should have a full ophthalmologic evaluation but it does not need to be repeated annually.

ECG (Choice B) is not part of the annual surveillance protocol for patients with NF2. Cardiac manifestations or arrhythmias are not part of the constellation of findings seen in NF2.

Periodic skin examination (Choice D) is warranted in patients with NF2, though an annual examination is not necessary.

Educational Objective: Neurofibromatosis type 2 is characterized by a constellation of findings: bilateral acoustic schwannomas, cataracts, meningiomas, and ependymomas. Annual brain MRI is indicated as routine surveillance for patients with NF2 in order to monitor for the development of new tumors and growth of existing tumors.

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7. A 3-year-old girl is brought to the clinic because of a 3-day history of low-grade fever and sore throat. She also has a 12-hour history of rash that began on her hands; the rash is not itchy or painful. She has no history of serious illness and receives no medications. Her temperature is 38.4°C (101.2°F), pulse is 132/min, respirations are 34/min, and blood pressure is 93/48 mm Hg. Examination shows multiple ulcers on the soft palate and posterior aspect of the pharynx. The lungs are clear to auscultation. A grade 2/6 ejection murmur is heard on cardiac examination; S_2 varies with inspiration. The abdomen is soft and nontender. The liver edge is palpated 2 cm below the right costal margin. There are multiple vesicles over the palms and digits. A dose of acetaminophen is administered. Which of the following is the most appropriate next step in management?

A) Acyclovir therapy
B) Blood culture
C) Echocardiography
D) Throat culture
E) Observation only

Correct Answer: E.

Observation only is the most appropriate management of this patient with hand-foot-and-mouth disease (HFMD). HFMD is a common childhood infection caused by coxsackievirus, an enterovirus. The transmission of coxsackievirus is typically fecal-oral and outbreaks often occur in the late summer or autumn. Affected individuals demonstrate painful oral ulcers with a sore throat or refusal to eat, vesicles classically on the palms and soles, and a low-grade fever. Coxsackievirus is also the cause of herpangina, which presents acutely with fever, throat pain, and dysphagia. The cornerstone of management of coxsackievirus infection is supportive care and most children do not require hospitalization. Hospitalization is necessary if neurologic or cardiovascular complications develop or if the child is unable to maintain adequate hydration.

Incorrect Answers: A, B, C, and D.

Acyclovir therapy (Choice A) is not used in the treatment of coxsackievirus infections as the enzyme required to activate acyclovir, thymidine kinase, is lacking in this group of viruses.

Blood culture (Choice B) is not necessary in the management of HFMD. Blood culture would be appropriate if there was concern for bacteremia. However, this patient's findings are consistent with HFMD.

Echocardiography (Choice C) is warranted in children with mucocutaneous lymph node syndrome (Kawasaki disease), which may also present with erythema of the tongue and oral mucosa along with cutaneous findings. However, this patient's oral ulcers and skin vesicles are not a common finding in mucocutaneous lymph node syndrome (Kawasaki disease).

Throat culture (Choice D) is unnecessary in this patient as HFMD is a clinical diagnosis.

Educational Objective: HFMD is a common childhood infection caused by coxsackievirus, which causes painful oral ulcers with a sore throat or refusal to eat, vesicles classically on the palms and soles, and a low-grade fever. The management of HFMD primarily consists of supportive care.

8. A previously healthy 7-year-old boy is brought to the physician because of a 3-week history of pain in his left shoulder and arm. He has difficulty raising his left arm over his head. The pain is worse with motion and at night; it often awakens him from sleep. Over-the-counter medications have not relieved the pain. There is no history of trauma. Examination of the left shoulder shows diffuse tenderness of the greater tuberosity involving the entire humoral head. Passive range of motion of the left shoulder is limited to 90 degrees of abduction and 70 degrees of forward flexion. Extension and flexion of the left wrist are full. Muscle strength and sensation are intact. Radial pulses are palpable bilaterally. X-rays of the left upper extremity are shown. Which of the following is the most appropriate next step in management?

A) MRI of the left upper extremity
B) Corticosteroid therapy
C) Electromyography
D) Arteriography of the left upper extremity
E) Amputation of the left upper extremity

Correct Answer: A.

This pediatric patient with a subacute course of shoulder pain and an x-ray demonstrating bony disorganization and destruction in the superior humerus likely has osteosarcoma. Osteosarcoma is the most common primary osseous malignancy in children. It is characterized by cells with enlarged nuclei and a disorganized tissue structure that demonstrates areas of osteoid production (mineralized collagen that provides the structure of bone). This malignancy is locally destructive to bone and can erode through the cortex resulting in a periosteal reaction with elevation of the periosteum along with irregular, ragged borders and areas of disorganized osteogenesis as seen in this case. It typically occurs in long bones, often involving the tibia or femur. The initial presentation generally includes pain and swelling, though a fragility fracture may be the declaring presentation. Osteosarcoma has a high mortality rate and high rate of metastasis to the lungs, even with adequate surgical resection. Even when initial staging does not detect metastatic disease, individual or small groups of cells may have already metastasized yet remain below the threshold of detection. Diagnosis involves imaging and tissue sampling; in this case, the initial x-rays should be followed by MRI for high-resolution delineation of the lesion itself and to facilitate a surgical approach for resection or biopsy. Treatment typically includes surgical resection combined with chemotherapy.

Incorrect Answers: B, C, D, and E.

Corticosteroid therapy (Choice B) is employed in treating many infectious, inflammatory, and malignant diseases, but does not have an immediate role in the management of osteosarcoma, especially prior to confirming the diagnosis. A notable exception to this would be if spinal or brain lesions were affecting neurologic function.

Electromyography (Choice C) would be appropriate as a next step in cases where a neuromuscular disease such as muscular dystrophy or myasthenia gravis were suspected. It would not offer diagnostic support in cases of suspected malignancy in absence of paraneoplastic syndromes (eg, Lambert Eaton).

Arteriography of the left upper extremity (Choice D) would be reasonable in cases of suspected arterial occlusion or arteriovenous malformation. Arterial occlusions present abruptly with pain, paresthesia, pulselessness, and paralysis, and would be exceedingly rare in a child without a history of hypercoagulability. Arteriovenous malformations are generally asymptomatic unless they result in high output heart failure, limb ischemia, or exsanguination. Unless calcified, they would not generally be visible on non-contrast x-ray.

Amputation of the left upper extremity (Choice E) would be premature without an established diagnosis in a pediatric patient. Attempts at limb-salvage should occur prior to amputation decisions in children.

Educational Objective: Osteosarcoma is the most common primary osseous malignancy in children. It presents with bony destruction, visualized on x-ray as cortical/periosteal irregularity and elevation. MRI is appropriate to further delineate the lesion, and treatment generally involves a combined surgical and medical approach.

9. A 62-year-old woman comes to the physician because of a 6-month history of increasingly severe left knee pain and a "giving-way" sensation while walking. The pain occurs in the front of the knee and is exacerbated by walking up stairs or sitting in a car for prolonged periods of time. There is no history of trauma. Five years ago, she underwent a discectomy for herniation of L3–4. She is 158 cm (5 ft 2 in) tall and weighs 113 kg (250 lb); BMI is 46 kg/m^2. Examination of the left knee shows no joint effusion. There is tenderness to palpation along the patella. Muscle strength in both lower extremities is 5/5. Sensation to light touch is decreased over the left hallux. Pedal pulses are 2+ bilaterally. Which of the following is the most likely diagnosis?

A) Anterior cruciate ligament tear
B) Chondromalacia patella
C) Lumbar radiculopathy
D) Medial meniscus tear
E) Prepatellar bursitis

Correct Answer: B.

This older female patient with chronic anterior knee pain and instability is likely experiencing chondromalacia patella. Chondromalacia refers to degeneration or inflammation of the peripatellar cartilage, which normally permits the patella to glide smoothly over the surface of the distal femur during flexion and extension of the knee. Overuse (eg, in athletes, in overweight patients) is a common trigger for peripatellar cartilage inflammation. Patients generally present with symptoms of knee pain and instability especially when the knee is held in flexion (eg, ascending stairs, sitting with a flexed knee for a prolonged period of time). The examination is generally unremarkable apart from tenderness over the patella or with range of motion about the patella as is the case with this patient. Diagnosis is generally clinical, though in cases where the diagnosis is less evident or equivocal, MRI can be employed to confirm the diagnosis and rule out competing differentials. Treatment is generally nonsurgical, and involves anti-inflammatory medications, rest, ice, and physical therapy to strengthen the surrounding muscles, tendons, and ligaments. Behavioral modification to prevent triggers also reduces symptoms. Surgical approaches have thus far not been shown to significantly improve the condition in isolation.

Incorrect Answers: A, C, D, and E.

Anterior cruciate ligament tear (Choice A) is a common injury among athletes and is generally sustained when the knee experiences an abrupt load of force, such as when stopping, landing, or changing direction. It is common among basketball, soccer, tennis, and football players. On examination, the patient may generate laxity with anterior motion of the tibia on the femur, known as the anterior drawer test.

Lumbar radiculopathy (Choice C) presents with shooting pain and paresthesia in the distribution of the affected lumbar nerve root and may result in weakness or hyporeflexia in severe cases of nerve impingement. This patient's examination shows normal strength, and her decreased sensation over the left hallux suggests a low lumbar or high sacral lesion if it can be attributed to a radiculopathy at all, which is distinct from the dermatome that involves the knee.

Medial meniscus tear (Choice D) is a common injury among athletes, and generally results from a twisting force being applied to a flexed knee. It generally presents with acute pain, a knee effusion, and tenderness over the medial joint line. The McMurray test may be positive on physical examination.

Prepatellar bursitis (Choice E) presents with pain, erythema, and swelling over the anterior knee, and is generally caused by overuse or pressure applied to the bursa with the knee in flexion. This patient's examination is inconsistent.

Educational Objective: Chondromalacia patella presents with symptoms of knee pain and instability, especially when the knee is held in flexion, and results from degeneration or inflammation of the peripatellar cartilage, which normally permits the patella to glide smoothly over the surface of the distal femur. Overuse (eg, in athletes, in overweight patients) is a common trigger for peripatellar cartilage inflammation. Treatment includes physical therapy in combination with anti-inflammatory medications and rest.

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10. A 27-year-old woman comes to the physician because of a 3-day history of temperatures to 39.4°C (103°F). She has not had any other symptoms. She underwent splenectomy at the age of 17 years because of injuries she sustained in a motor vehicle collision. She has no history of serious illness and takes no medications. Her father died of alcoholic hepatitis and cirrhosis. She is sexually active with multiple partners and does not use condoms. She has smoked one pack of cigarettes daily for 15 years. She occasionally drinks alcohol. She has an 8-year history of frequent crack cocaine use and daily intravenous heroin use. She appears ill. Her temperature is 39.8°C (103.7°F), pulse is 120/min and regular, respirations are 24/min, and blood pressure is 80/60 mm Hg. Examination shows no other abnormalities. Laboratory studies show:

Hematocrit	33%
Leukocyte count	21,000/mm^3
Segmented neutrophils	85%
Bands	9%
Lymphocytes	6%
Platelet count	490,000/mm^3
Urine	
RBC	10/hpf
WBC	2/hpf
Bacteria	negative

Serum studies show no abnormalities. Results of blood cultures are pending. A chest x-ray and transthoracic echocardiography show no abnormalities. Which of the following is the most appropriate initial antibiotic therapy for this patient?

A) Highly active antiretroviral therapy
B) Oral levofloxacin
C) Intramuscular ceftriaxone and oral doxycycline
D) Intravenous ceftriaxone and azithromycin
E) Intravenous vancomycin and gentamicin
F) No antibiotic therapy is indicated at this time

Correct Answer: E.

This patient with a history of intravenous drug use and immunosuppression secondary to prior splenectomy presenting with fever, leukocytosis, and hypotension consistent with septic shock raises concern for bacteremia and endocarditis, especially when no other source of infection can be found (normal urinalysis and chest x-ray). Bacterial endocarditis refers to acute or subacute bacterial infection of the cardiac valvular endocardium, most commonly from infection with *Staphylococcus aureus* (acute) or viridans streptococci (subacute). It can present with an array of symptoms, most commonly fever, new cardiac murmur, anemia, glomerulonephritis, Roth spots, Osler nodes, and splinter hemorrhages in the nailbeds and conjunctiva. Risk factors for infection include prior valvular damage (eg, rheumatic heart disease), intravenous drug use, immunosuppression, prosthetic cardiac valves, and congenital heart disease. In a patient presenting with septic shock, the most appropriate initial antibiotic therapy involves broad spectrum antibiotics including coverage for methicillin-resistant *Staphylococcus aureus* (MRSA) such as vancomycin and gentamicin.

Incorrect Answers: A, B, C, D, and F.

Highly active antiretroviral therapy (Choice A) would be the treatment of choice in the setting of acute HIV infection. This patient is presenting with a likely bacterial infection such as bacterial endocarditis, and antibiotics are the treatment of choice.

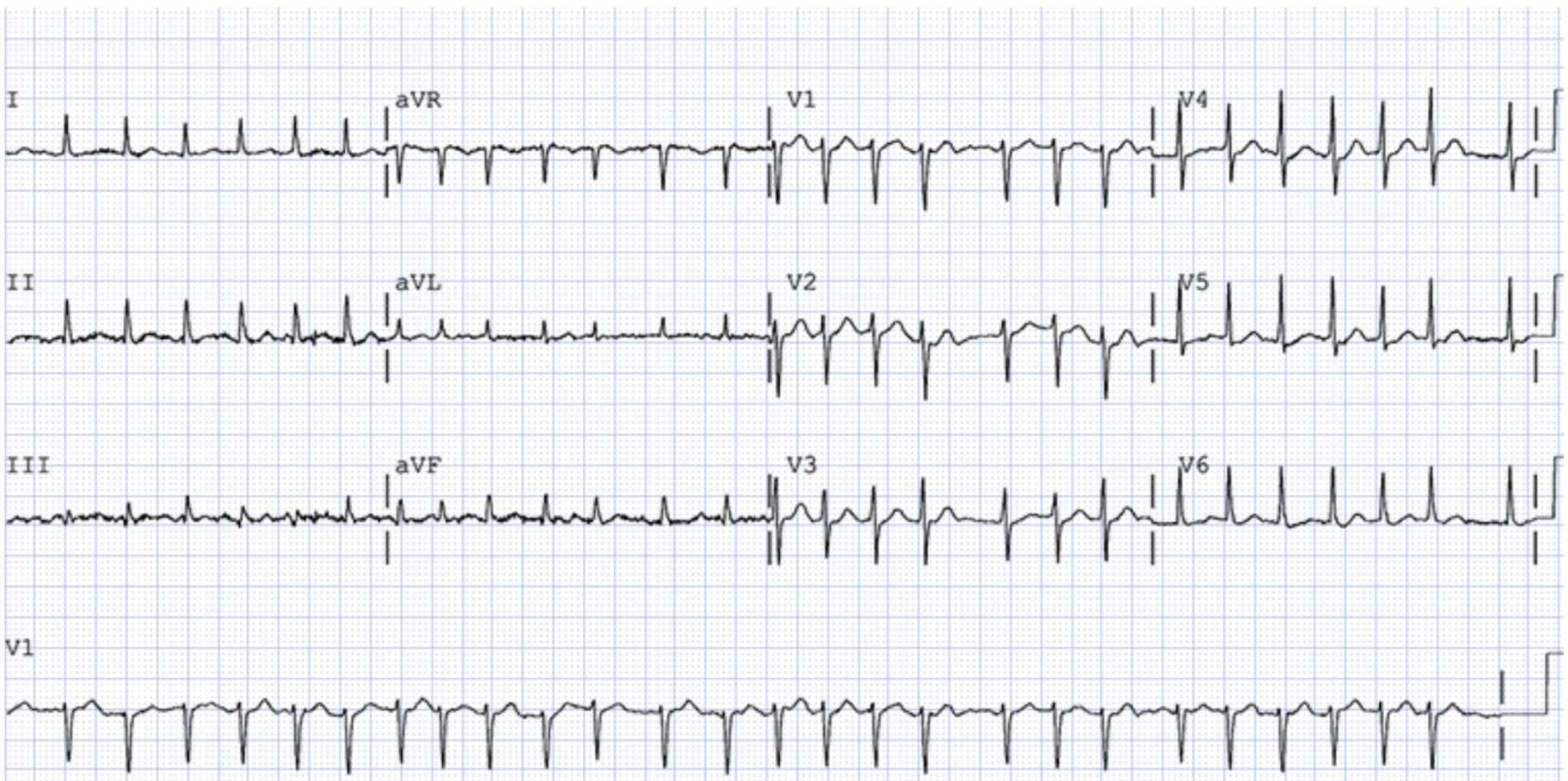
Oral levofloxacin (Choice B) would be inadequate given this patient's presentation in severe septic shock; broad spectrum intravenous medications should be given.

Intramuscular ceftriaxone and oral doxycycline (Choice C) is the treatment of choice for suspected or confirmed gonorrhea and chlamydia, sexually transmitted infections which can present with vaginal discharge and dysuria.

Intravenous ceftriaxone and azithromycin (Choice D) are narrow-spectrum antibiotics that would be unlikely to adequately cover this patient's bacteremia. As a result of the history of intravenous drug use, an initial antibiotic regimen should cover MRSA.

No antibiotic therapy (Choice F) would be inappropriate as this patient is presenting in septic shock with fever, tachycardia, tachypnea, hypotension, and leukocytosis. Early intravenous antibiotics have been shown to decrease morbidity and mortality in septic shock.

Educational Objective: Bacteremia and bacterial endocarditis can present with septic shock, especially in patients with a history of prior intravenous drug use or immunosuppression. Early broad-spectrum antibiotics are imperative in patients with septic shock and should cover MRSA.



11. A 52-year-old man is brought to the emergency department because of a 6-hour history of thirst and fatigue and a 2-hour history of light-headedness. He has been working outside during the past 2 days in temperatures reaching 90.0°F. He has no history of serious illness and takes no medications. On arrival, he is lethargic and disoriented. His temperature is 37.2°C (99.0°F), pulse is 150/min and irregular, respirations are 16/min, and blood pressure is 78/50 mm Hg. The lungs are clear to auscultation; no bruits are heard. No murmurs are noted on cardiac examination. The abdomen is nontender. ECG is shown. In addition to administration of 0.9% saline, which of the following is the most appropriate next step in management?

A) Administration of amiodarone
B) Administration of diltiazem
C) Administration of labetalol
D) Carotid massage
E) Electrical cardioversion

Correct Answer: E.

This patient's ECG shows an irregular, narrow-complex tachyarrhythmia lacking P-waves, consistent with atrial fibrillation with rapid ventricular response. Atrial fibrillation with rapid ventricular response (heart rate >100 beats/minute) can result in reduced stroke volume and decreased cardiac output leading to symptomatic heart failure, and potentially hypotension and hemodynamic instability in severe cases. This patient is presenting with hemodynamically unstable atrial fibrillation with hypotension and tachycardia. The most appropriate initial treatment is synchronized cardioversion to quickly correct the arrhythmia and restore adequate cardiac output. Inciting causes should be investigated and managed, in this case, volume depletion and heat-related illness are likely contributing.

Incorrect Answers: A, B, C, and D.

Administration of amiodarone (Choice A), diltiazem (Choice B), or labetalol therapy (Choice C) are appropriate options for hemodynamically stable patients presenting with atrial fibrillation with rapid ventricular response. Rate control with diltiazem or labetalol is recommended for most patients as opposed to rhythm control with amiodarone because of similar efficacy and fewer side effects and negative outcomes. Synchronized cardioversion is more appropriate in this hemodynamically unstable patient.

Carotid sinus massage (Choice D) increases vagal output resulting in an increased atrioventricular node refractory period and can be utilized as a first-line attempt to slow supraventricular tachyarrhythmias such as atrioventricular nodal reentrant tachycardia. It does not have a common role in the treatment of atrial fibrillation with rapid ventricular response.

Educational Objective: Hemodynamically unstable atrial fibrillation with rapid ventricular response requires immediate treatment with synchronized cardioversion to restore normal sinus rhythm and adequate cardiac output.

12. A 62-year-old woman is brought to the emergency department by paramedics 30 minutes after the onset of sharp, anterior chest pain. She is otherwise asymptomatic. Administration of nitroglycerin en route to the hospital has not relieved her symptoms. She has type 2 diabetes mellitus, hypertension, and peripheral artery disease. She underwent laparoscopic cholecystectomy 1 year ago. Her medications are insulin, ramipril, hydrochlorothiazide, atorvastatin, and aspirin. Her pulse is 96/min, respirations are 12/min, and blood pressure is 124/76 mm Hg. The lungs are clear to auscultation. A normal S_1 and S_2 are heard. Peripheral pulses are decreased bilaterally. An ECG shows a left bundle branch block; review of her medical records shows that a routine ECG 1 year ago showed no abnormalities. Her serum troponin I and myoglobin concentrations are within the reference ranges. The patient is admitted to the hospital. Which of the following is the most appropriate next step in diagnosis?

A) Exercise stress test
B) Cardiac stress scintigraphy
C) Positron emission tomography
D) Electrophysiologic studies
E) Cardiac catheterization

Correct Answer: E.

This patient who is presenting with anterior chest pain refractory to nitroglycerin and a new left bundle branch block raises concern for ischemic heart disease and acute coronary syndrome. Although serum troponin I and myoglobin concentrations are within the reference ranges, the rise of cardiac biomarkers in the setting of acute coronary syndrome is often delayed. There are three primary categories of acute coronary syndrome (ACS): unstable angina (UA), non-ST-elevation myocardial infarction (NSTEMI), and ST-elevation myocardial infarction (STEMI). A STEMI presents with chest pain, ST elevations on ECG, and positive cardiac biomarkers (eg, troponin). Unstable angina is one type of acute coronary syndrome and is characterized by new onset chest pain in conjunction with ECG changes, but with normal cardiac biomarkers. All acute coronary syndromes are treated similarly with full dose anticoagulation and dual antiplatelet therapy followed by cardiac catheterization.

Incorrect Answers: A, B, C, and D.

Exercise stress test (Choice A) may be indicated, but first, the patient must be urgently admitted to the hospital for further diagnostic work-up and management of acute coronary syndrome. Cardiac stress scintigraphy (Choice B) such as dipyridamole-thallium-201 scintigraphy, is a non-exertional test which is used to evaluate cardiac perfusion in patients who are unable to exercise. Exertional and non-exertional stress tests are useful to evaluate risk of coronary artery disease, but only after acute coronary syndrome is ruled out.

Positron emission tomography (Choice C) is a nuclear medicine imaging study that involves visualization of metabolically active tissue and can be helpful in the localization of certain tumors. In suspected acute coronary syndrome, cardiac catheterization is the imaging study of choice.

Electrophysiologic studies (Choice D) are appropriate to evaluate for cardiac conduction system abnormalities but would follow evaluation for an acute coronary syndrome in this case.

Educational Objective: Acute coronary syndrome can present with acute chest pain in conjunction with ECG changes. Acute coronary syndrome is treated with full dose anticoagulation and dual antiplatelet therapy followed by cardiac catheterization.

13. An 82-year-old woman is brought to the emergency department by her daughter because of shortness of breath. Each night for the past week, the patient has awakened with shortness of breath; she has found that using three pillows instead of one allows her to breathe more easily at night. Two days ago, she had shortness of breath with exertion, and 8 hours ago, she had the sudden onset of mild shortness of breath at rest. She also has a 4-day history of swelling of her ankles and feet. Her only medication is 81-mg aspirin. On arrival, she is in mild respiratory distress but able to speak in complete sentences. Her temperature is 37°C (98.6°F), pulse is 86/min, respirations are 16/min, and blood pressure is 162/88 mm Hg. Examination shows jugular venous distention. Bilateral basilar crackles are heard over the lower quarter of the lung fields. Cardiac examination shows a regular rhythm. A grade 2/6 holosystolic murmur is heard best at the apex with the patient in the left lateral decubitus position. There is 2+ pitting edema of the ankles. In addition to furosemide, administration of which of the following is the most appropriate next step in pharmacotherapy?

A) Digoxin
B) Dobutamine
C) Lisinopril
D) Milrinone
E) Nifedipine
F) Nitroprusside

Correct Answer: C.

This patient's 2/6 holosystolic murmur best heard at the apex with the patient in the left lateral decubitus position is characteristic of mitral valve regurgitation. Mitral valve regurgitation can cause increased pulmonary vasculature pressures and fluid back up, such as in left-sided congestive heart failure. Left-sided heart failure presents with dyspnea on exertion, reduced exercise tolerance, paroxysmal nocturnal dyspnea, orthopnea, and shortness of breath. If right-sided heart failure is also present, weight gain and edema may be reported. Physical examination often shows jugular venous distension, pitting peripheral edema, bibasilar rales, a displaced apical impulse, and an S_3 or S_4 gallop. ACE inhibitors, such as lisinopril, have been shown to decrease mortality and are first-line therapy in the treatment and management of congestive heart failure, in addition to diuretics to decrease volume overload.

Incorrect Answers: A, B, D, E, and F.

Digoxin (Choice A) is used for symptomatic relief in systolic heart failure as it improves cardiac myocyte contractility through inhibition of the sodium-potassium ATPase. While it improves symptoms of congestive heart failure, it has not been shown to decrease mortality such as with lisinopril.

Dobutamine (Choice B) and milrinone (Choice D) are utilized in the treatment of cardiogenic shock and advanced heart failure. Cardiogenic shock can occur when decreased cardiac output leads to organ hypoperfusion. This patient does not display signs of cardiogenic shock including hypotension, cool extremities, or respiratory distress, and therefore dobutamine and milrinone would not be indicated.

Nifedipine (Choice E) is a dihydropyridine calcium-channel blocking agent and is a potent arteriolar vasodilator used in the treatment of hypertension.

Nitroprusside (Choice F) is an intravenous, titratable vasodilator that can be used for the treatment of hypertensive emergencies. Sodium nitroprusside preferentially dilates arterial vessels over venous vessels, resulting in a decrease in afterload without significant change in preload.

Educational Objective: ACE inhibitors, such as lisinopril, have been shown to decrease mortality and are first-line therapy in the treatment and management of congestive heart failure, in addition to diuretics to decrease volume overload.

14. A 44-year-old woman comes to the physician because of a 2-week history of nonproductive cough that worsens at night. She says occasionally she has coughed so hard that she vomited or had loss of urine. Between these episodes, she feels well. She has not had fever, night sweats, shortness of breath, wheezing, chills, weight loss, or cough productive of bloody sputum. She says her symptoms began as a cold with sore throat and runny nose and seemed to improve by the end of the first week, but then she began coughing. Use of over-the-counter cold medicine has not provided relief of her cough. Results of a PPD skin test 1 year ago were negative. The patient has no history of asthma, hypertension, or allergies. She takes no medications. She does not smoke cigarettes. Her three children recently had similar illnesses, but she says their symptoms resolved within 1 week. They attend school, and their vaccinations are up-to-date. The patient volunteers at a homeless shelter twice monthly. Her temperature is 37.2°C (99°F), pulse is 72/min and regular, respirations are 16/min, and blood pressure is 122/76 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. Examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) *Bordetella pertussis* polymerase chain reaction test
B) Spirometry
C) Sputum culture for *Haemophilus influenzae* type b
D) Sputum culture for acid-fast bacillus
E) X-ray of the chest

Correct Answer: A.

Episodes of severe paroxysmal coughing are concerning for pertussis. Pertussis occurs as a result of an infection from *Bordetella pertussis* and classically presents in three stages. The initial, catarrhal stage presents with fever, rhinorrhea, and a mild cough. This progresses to the paroxysmal stage after 1 to 2 weeks, in which patients experience violent bouts of extreme coughing, at times violent enough to cause secondary traumatic injury such as rib fractures, incontinence, and pneumothorax. Often, such coughing fits are accompanied by cyanosis and may be followed by syncope, emesis, or apnea. The paroxysmal stage can last for weeks to months. Symptoms resolve during the convalescent stage, which lasts from 1 to 4 weeks. Pertussis toxin causes impaired recruitment and migration of phagocytes and production of inflammatory mediators. Patients often have significant lymphocytosis. The diagnosis is confirmed with polymerase chain reaction amplification of *B. pertussis* DNA. Pertussis is treated with antibiotics, typically macrolides, and supportive care. Pertussis can be prevented with immunization in the form of acellular pertussis, typically administered along with tetanus and diphtheria vaccines. Vaccination against pertussis provides a good degree of protection for the first several years, but this protection commonly wanes over time. Booster vaccinations are recommended every 10 years.

Incorrect Answers: B, C, D, and E.

Spirometry (Choice B) is useful for the diagnosis of obstructive lung disease, including chronic obstructive pulmonary disease. The cough associated with chronic obstructive pulmonary disease is typically chronic, productive of mucus, and is not paroxysmal. A recent exposure to similar symptoms in her children suggests an acute infectious process, rather than chronic obstructive pulmonary disease.

Sputum culture for *Haemophilus influenzae* type b (Choice C) may be useful for the diagnosis of pneumonia or bronchitis secondary to *H. influenzae*. While bronchitis and pneumonia may be accompanied by coughing, the presence of vomiting or loss of urine suggests severe, paroxysmal coughing, which is more suggestive of pertussis.

Sputum culture for acid-fast bacillus (Choice D) is useful for the diagnosis of tuberculosis. Tuberculosis is not commonly encountered in the United States outside of particular populations, such as prisoners or homeless patients. It is not commonly encountered in schools in the United States, which is this patient's most likely route of exposure to pertussis.

X-ray of the chest (Choice E) may demonstrate focal consolidation, edema, or atelectasis in the setting of pertussis, but is less specific in comparison to polymerase chain reaction for the diagnosis of pertussis.

Educational Objective: Pertussis occurs as a result of an infection from *B. pertussis* and may lead to severe paroxysmal coughing, which may be accompanied by cyanosis and followed by syncope, emesis, or apnea. Pertussis is treated with antibiotics, typically macrolides, and supportive care.

15. An 18-year-old woman comes to the physician in the fall because of episodes of coughing and wheezing since she moved from the Midwest to New England to attend college 3 weeks ago. The episodes have been occurring several times daily and are associated with a sensation of tightness in her chest. During this period, she has had decreased stamina during exercise. She has had one episode of bronchitis each winter for 3 years. She has no history of serious illness and takes no medications. She does not smoke cigarettes. She is not in respiratory distress. Vital signs are within normal limits. The lungs are clear to auscultation. Spirometry shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Allergy skin testing
B) Chest x-ray
C) CT scan of the sinuses
D) Exercise stress test
E) Inhaled albuterol therapy
F) Measurement of diffusion capacity for carbon monoxide
G) Oral azithromycin therapy

Correct Answer: E.

Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. Patients present with episodes of wheezing, dry cough, and dyspnea. The management of asthma exacerbations is directed toward maintaining oxygenation, rapidly reversing bronchospasm, and alleviating symptoms of respiratory distress. Short-acting inhaled β-adrenergic agonists, such as albuterol, are first-line therapy for the management of asthma exacerbations and intermittent asthma. Anticholinergics, steroids, and magnesium are also often employed in moderate to severe exacerbations. Patients with persistent asthma are controlled on a long-term basis with inhaled or systemic steroids, leukotriene receptor antagonists, mast cell stabilizers, and long-acting β-adrenergic agonists.

Incorrect Answers: A, B, C, D, F, and G.

Allergy skin testing (Choice A) may be useful in the evaluation of allergic asthma. Most patients with intermittent asthma do not require skin testing unless there is concern for a specific allergen. Patients with persistent asthma should undergo allergen skin testing.

Chest x-ray (Choice B) is useful for the diagnosis of pneumonia but is typically normal in the setting of asthma.

CT scan of the sinuses (Choice C) is useful for the diagnosis of acute or chronic sinusitis, which typically presents with rhinorrhea, congestion, and headache, rather than cough and wheezing.

Exercise stress testing (Choice D) may be useful for the diagnosis of exercise-induced asthma, which presents with symptoms that worsen in association with exercise. Generally, this term references a cardiac stress test, and this young, healthy patient is unlikely at this age to have any significant coronary artery disease.

Measurement of diffusion capacity for carbon monoxide (Choice F) is used to diagnose cases where there exists a loss of alveolar surface area or damage to the alveolar wall, such as in emphysema or pulmonary fibrosis. This test is not necessary for patients with intermittent asthma. Patients with asthma usually demonstrate a normal diffusion capacity for carbon monoxide but may demonstrate an increased diffusion capacity caused by an increased capillary blood volume and lung hyperinflation.

Oral azithromycin therapy (Choice G) or treatment with other antibiotics is not beneficial in the treatment of asthma exacerbation when there is no inciting infectious precipitant and contributes to antibiotic resistance.

Educational Objective: Short-acting inhaled β-adrenergic agonists, such as albuterol, are first-line therapy for the management of asthma exacerbations.

16. A 2-year-old boy is admitted to the intensive care unit through the emergency department 20 minutes after his parents found him at the bottom of the backyard swimming pool. The parents report that when they pulled their son from the pool, he was not breathing and had no pulse. They are unsure of the duration of the submersion. They administered cardiopulmonary resuscitation for 10 minutes until emergency medical technicians arrived. En route to the emergency department, the patient was intubated and mechanically ventilated with 100% oxygen at a rate of 20 breaths per minute, after which his pulse returned at a rate of 150/min. On arrival in the emergency department, vital signs were temperature 36.5°C (97.7°F), pulse 150/min, and blood pressure 100/60 mm Hg. Pulse oximetry on 100% oxygen showed an oxygen saturation of 100%. Now, in the intensive care unit, his vital signs are unchanged. He has spontaneous respirations, and he is reaching for his endotracheal tube. His parents want to know if he will survive. Which of the following factors would most strongly suggest a good prognosis in this patient?

A) Age of 2 years

B) Pulse greater than 100/min en route

C) Purposeful movements in the intensive care unit

D) Resuscitation without the use of epinephrine

E) Temperature greater than 35.0°C (95.0°F) in the emergency department

Correct Answer: C.

Drowning in children can result in a variety of clinical presentations depending on the severity of the drowning incident. Patients can present with aspiration, hypoxemia, respiratory distress, and laryngospasm. Hypoxemia can lead to ischemic neuronal damage resulting in cerebral edema. In the case of drowning, aspirated fluid causes local inflammation in the lung, along with the dilution of surfactant, leading to impaired compliance and airspace infiltration. This can result in persistent and severe hypoxia despite management with positive-end-expiratory pressure and increased fraction of inspired oxygen. Prolonged hypoxia leads to end organ dysfunction including acidosis, hypoxic brain injury, and cardiac arrhythmias. Exposure of the alveoli to water can lead to the development of acute respiratory distress syndrome (ARDS), which appears on chest imaging as non-cardiogenic pulmonary edema. Intubation and management of hypoxia is appropriate in patients with severe respiratory distress, hypoxic or hypercarbic respiratory failure, neurologic deterioration, or cardiac arrest. Adequate management of hypoxia decreases the risk for further complications of hypoxic brain injury. A patient with purposeful movements demonstrates good functional neurologic ability and indicates a good prognosis.

Incorrect Answers: A, B, D, and E.

Age (Choice A) and resuscitation without the use of epinephrine (Choice D) do not necessarily correlate with a good prognosis in cases of drowning. Prognosis and level of care depends on level of hypoxia, submersion time, oxygen requirement, presence of hypotension, and clinical features.

While return of spontaneous circulation with pulse greater than 100/min en route (Choice B) and normothermic temperature greater than 35.0°C (95.0°F) in the emergency department (Choice E) are promising clinical features, the clinical feature that most strongly suggests a good prognosis is good neurologic outcome evidenced by purposeful, spontaneous movement.

Educational Objective: Drowning in children can result in a variety of clinical presentations depending on the severity of the drowning incident. Patients can present with aspiration, hypoxemia, respiratory distress, and laryngospasm. Adequate management of hypoxia decreases the risk for further complications of hypoxic brain injury and increases the chance for good neurologic recovery.

17. A 42-year-old man is brought to the emergency department by the staff of a homeless shelter after they found him unconscious outside the shelter. He has alcohol use disorder, schizophrenia, hepatitis C, and cirrhosis. He has been treated for hepatic encephalopathy and ascites. On arrival, he is responsive only to painful stimuli. He is 188 cm (6 ft 2 in) tall and weighs 68 kg (150 lb); BMI is 19 kg/m^2. Temperature is 37.7°C (99.9°F), pulse is 130/min, respirations are 24/min, and blood pressure is 86/40 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. Examination shows jaundice and conjunctival icterus. There are multiple ecchymoses over all the extremities. Abdominal examination shows ascites and a fluid wave. The patient moans on palpation of the abdomen. There is trace edema of the ankles. All extremities are warm. Urine output has been 60 mL/h during the past 4 hours. In addition to obtaining a complete blood count, serum electrolyte concentrations, and urinalysis, which of the following is most likely to confirm the diagnosis?

A) Abdominal CT scan
B) Blood culture
C) Culture and Gram stain of abdominal fluid
D) Exploratory laparotomy
E) Flat and upright abdominal x-rays
F) Measurement of cell count and differential of abdominal fluid

Correct Answer: F.

Spontaneous bacterial peritonitis (SBP) occurs most frequently in cirrhotic states, although can occur in any setting causing ascites. SBP describes an infection within ascitic fluid in the peritoneal cavity, most often from translocated enteric flora such as *Escherichia coli*. The classic presentation includes fever along with diffuse abdominal pain and tenderness in a patient with ascites. Symptoms can include fever, encephalopathy, abdominal pain, and signs and symptoms of sepsis. If there is clinical concern for SBP, the ascitic fluid should be sampled through a paracentesis. Laboratory analysis of the ascitic fluid should include Gram stain, culture, and cell counts. A total leukocyte count of greater than 1,000/mm^3 or greater than 250 neutrophils/mm^3 is generally diagnostic of SBP since culture results are variably positive. Gram stain is not sensitive for the diagnosis, but common pathogens include enteric flora, *E. coli*, *Streptococcus* species, and *Klebsiella pneumoniae*. Antibiotics with Gram-negative rod coverage (eg, third generation cephalosporins) are first-line therapy.

Incorrect Answers: A, B, C, D, and E.

Abdominal CT scan (Choice A) is useful in the diagnosis of acute intra-abdominal pathologies such as appendicitis, small bowel obstruction, and diverticulitis. The patient's abdominal tenderness is most likely caused by SBP, an infection of ascitic fluid, and diagnosis is made by paracentesis.

Blood culture (Choice B) is an important diagnostic step in the treatment of sepsis and septic shock, but the diagnosis of SBP is made with paracentesis and evaluation of ascitic fluid.

Culture and Gram stain of abdominal fluid (Choice C) is typically done in the evaluation of ascitic fluid but is not sensitive for the diagnosis of SBP.

Exploratory laparotomy (Choice D) is often helpful for acute intra-abdominal pathology such as perforated ulcers, small bowel obstruction, and hypotension in the setting of penetrating abdominal trauma. It would not be diagnostic or therapeutic in the setting of SBP.

Flat and upright abdominal x-rays (Choice E) can be used to evaluate other intra-abdominal pathology, such as bowel obstruction. However, it would be non-diagnostic in the setting of SBP.

Educational Objective: Spontaneous bacterial peritonitis is characterized by the bacterial infection of ascitic fluid in the absence of an obvious source of infection and is a significant cause of mortality in patients with cirrhosis. Diagnosis is confirmed with a paracentesis of ascitic fluid demonstrating a total leukocyte count of greater than 1,000/mm^3 or greater than 250 neutrophils/mm^3.

18. A 26-year-old woman is admitted to the hospital because of a 3-month history of abdominal cramps, painful bowel movements, and worsening bloody diarrhea. During this time, she also has had fecal urgency and says she occasionally passes only mucus with some blood. She has had a 4.5-kg (10-lb) weight loss during the past month despite no change in appetite. She has not had nausea or vomiting. She has no history of serious illness and takes no medications. She is 170 cm (5 ft 7 in) tall and weighs 57 kg (125 lb); BMI is 20 kg/m^2. Her temperature is 37.8°C (100°F), pulse is 80/min, respirations are 16/min, and blood pressure is 112/68 mm Hg. Cardiopulmonary examination shows no abnormalities. Abdominal examination shows mild, diffuse tenderness; no masses are palpated. Bowel sounds are normal. There is no hepatosplenomegaly. Rectal examination produces pain; there are streaks of blood on the physician's gloved finger. Laboratory studies show:

Hemoglobin	9.5 g/dL
Hematocrit	29%
Mean corpuscular volume	75 µm^3
Leukocyte count	9700/mm^3
Erythrocyte sedimentation rate	65 mm/h
Serum	
Protein, total	6.3 g/dL
Albumin	3.5 g/dL
Ferritin	<10 ng/mL
C-reactive protein	3.5 mg/L (N=0.08–3.1)

Test of the stool for *Clostridium difficile* toxin is negative. A stool culture is negative. Colonoscopy shows continuous mucosal inflammation and ulceration from the rectum through the transverse colon. Which of the following is the most appropriate next step in management?

A) Azathioprine therapy
B) Infliximab therapy
C) Mesalamine therapy
D) Metronidazole therapy
E) Total parenteral nutrition

Correct Answer: C.

Subacute or chronic bloody diarrhea, abdominal pain, abdominal tenderness on examination, increased inflammatory markers, and colonoscopic evidence of continuous colonic mucosal inflammation is consistent with a diagnosis of ulcerative colitis. Ulcerative colitis is a chronic inflammatory condition within the spectrum of inflammatory bowel disease that results in inflammation and ulcerations of colonic mucosa, typically beginning in the rectum and advancing proximally. Symptoms include chronic abdominal pain, weight loss, bloody diarrhea, abdominal bloating, and tenesmus. Extraintestinal manifestations (eg, uveitis) also occur. In addition, because of the chronic inflammation of the colon, patients are at increased risk of developing colorectal carcinoma. Severe presentations can involve high fever, tachycardia, hypotension, leukocytosis, enlarged and dilated bowel, and impaired colonic motility, a constellation known as toxic megacolon. Diagnosis of ulcerative colitis is by colonoscopy and biopsy. Medications within the 5-aminosalicylic acid family, such as mesalamine or sulfasalazine, are preferred steroid-sparing treatments for ulcerative colitis. Mesalamine exerts a variety of anti-inflammatory effects to reduce inflammation within colonic mucosa. Its primary mechanism of action is by reducing the production of leukotrienes and prostaglandins. Mesalamine is typically well-tolerated, including by patients with sulfa allergies, in contrast to sulfasalazine. Patients with severe disease may require steroids or immunomodulators, and refractory disease or that associated with toxic megacolon may require partial or total colectomy.

Incorrect Answers: A, B, D, and E.

Azathioprine (Choice A) and infliximab (Choice B) are used in cases that fail to respond to 5-aminosalicylic acid treatment. These agents are reserved for severe disease given their adverse effects. Azathioprine is a purine analogue and is associated with hepatotoxicity and leukopenia, as well as headaches, vomiting, and diarrhea. Infliximab is a monoclonal antibody against tumor necrosis factor alpha. Its side effects include myelosuppression and re-activation of latent tuberculosis or hepatitis B.

Metronidazole (Choice D) is useful for the treatment of parasitic gastrointestinal infections, such as giardiasis. While giardiasis may present with chronic diarrhea and weight loss in a minority of patients with severe infection, this patient's colonoscopic findings are more suggestive of ulcerative colitis.

Total parenteral nutrition (Choice E) plays no role in the management of ulcerative colitis apart from cases where bowel rest is required, and is associated with significant risks, including thrombosis, electrolyte derangements, sepsis, and death.

Educational Objective: Mesalamine is a salicylate-derived anti-inflammatory drug used for the management of ulcerative colitis. Its primary mechanism of action is by reducing the production of leukotrienes and prostaglandins. Mesalamine is typically well-tolerated, including by patients with sulfa allergies, in contrast to sulfasalazine.

19. A 47-year-old man comes to the physician for a routine health maintenance examination. He feels well. He has no history of serious illness and takes no medications. His mother was diagnosed with breast cancer at the age of 60 years; his father has hypertension and hyperlipidemia; and his maternal grandmother was diagnosed with colon cancer at the age of 47 years. The patient has smoked one-half pack of cigarettes daily for 25 years and drinks three to four beers on weekends. He does not use illicit drugs. He is 183 cm (6 ft) tall and weighs 90 kg (199 lb); BMI is 27 kg/m^2. His pulse is 70/min, and blood pressure is 120/85 mm Hg. Examination shows no abnormalities. Which of the following is the most appropriate recommendation for this patient regarding colon cancer screening?

A) Stool DNA testing now
B) Stool DNA testing at the age of 50 years
C) Colonoscopy now
D) Colonoscopy at the age of 50 years
E) Flexible sigmoidoscopy now
F) Flexible sigmoidoscopy at the age of 50 years

Correct Answer: D.

The United States Preventive Services Task Force (USPSTF) recommends routine colorectal cancer screening for all patients at average risk of colon cancer beginning at age 50 years and continuing until age 75 years. Colorectal cancer is common and early detection and treatment have been demonstrated to reduce morbidity and mortality. A positive family history of colon cancer in a first-degree relative confers an increased risk of developing colon cancer. While the USPSTF and American Cancer Society guidelines do not directly address high risk populations, the United States Multi-Society Task Force on Colorectal Cancer recommends that patients with a first-degree relative with a history of colon cancer undergo screening every 5 years, beginning at an age 10 years less than the age at diagnosis of the first-degree relative, or at age 40, whichever is earlier. This patient, who has a history of colon cancer in his maternal grandmother, is at average risk of colon cancer and should undergo screening at age 50. A variety of tests may be used for colorectal cancer screening. Colonoscopy remains the gold standard screening test, as it allows direct visualization and excision of polyps throughout the length of the colon. Other direct visualization tests such as flexible sigmoidoscopy may be acceptable in some patients. Other testing strategies include stool-based tests, such as test of the stool for occult blood, fecal immunochemical test, and CT colonography.

Incorrect Answers: A, B, C, E, and F.

Screening now with either stool DNA testing (Choice A), colonoscopy (Choice C), or flexible sigmoidoscopy (Choice E) is not indicated in this patient, who is at average risk of colon cancer and who should undergo screening at age 50.

Stool DNA testing at age 50 (Choice B) with FIT-DNA testing is less sensitive and specific for detection of colon cancer in comparison with colonoscopy and is more costly and less specific in comparison with annual fecal immunochemical testing.

Flexible sigmoidoscopy at age 50 (Choice F) is not preferable to colonoscopy, given that it only provides direct visualization of the distal colon. This may be an acceptable option in select patients, although colonoscopy remains the gold standard screening test.

Educational Objective: While the USPSTF and American Cancer Society guidelines do not directly address high risk populations, the United States Multi-Society Task Force on Colorectal Cancer recommends that patients with a first-degree relative with a history of colon cancer undergo screening every 5 years, beginning at an age 10 years less than the age at diagnosis of the first-degree relative, or at age 40, whichever is earlier. A variety of screening tests are available, although colonoscopy remains the gold standard. Average risk patients follow guidelines with testing beginning at age 50.

20. A 72-year-old woman comes to the emergency department because of a 3-day history of bright red rectal bleeding. She also has had moderate left-sided lower abdominal cramps that decrease in intensity shortly after the passage of bloody stools. She has no history of similar symptoms. A colonoscopy at the age of 65 years showed mild diverticular disease and no polyps or cancers. She has coronary artery disease and cardiomyopathy with a left ventricular ejection fraction of 15%. Her medications are an ACE inhibitor, a β-adrenergic blocking agent, oral nitrates, a statin, an aldosterone receptor antagonist, and a loop diuretic. The dose of the loop diuretic was increased 10 days ago during a routine examination because of volume overload. She appears healthy and is not in acute distress. Her temperature is 37°C (98.6°F), pulse is 100/min, respirations are 20/min, and blood pressure is 90/65 mm Hg. There is no jugular venous distention with the patient lying at a 45-degree angle. The lungs are clear to auscultation. Cardiovascular examination shows a displaced point of maximal impulse and a soft S_3 gallop. Abdominal examination shows tenderness to deep palpation in the left lower quadrant with minimal guarding; there is no rebound. Bowel sounds are normal. The liver cannot be palpated. Rectal examination shows scant stool with a small amount of blood on the examination glove. There is no edema of the lower extremities. Which of the following is the most likely diagnosis?

A) Colon cancer
B) Diverticulitis
C) Ischemic colitis
D) Mesenteric venous thrombosis
E) Sigmoid volvulus

Correct Answer: C.

Ischemic colitis refers to inadequate blood supply to the colon, which can lead to bowel wall necrosis, loss of immune barriers, and bowel perforation. Ischemic colitis most commonly occurs in the setting of atherosclerosis resulting in plaque rupture within a mesenteric vessel, systemic hypotension (eg, shock), or emboli such as in atrial fibrillation. Diminished blood flow within a vascular territory results if a specific mesenteric artery is occluded or narrowed. In the case of systemic hypotension, blood flow will be reduced within a watershed region. Patients typically present with acute abdominal pain and cramping associated with bloody bowel movements if bowel necrosis has occurred. Imaging may demonstrate thickening of the bowel wall along with pneumatosis intestinalis and possible portal venous gas or pneumoperitoneum. Diagnosis of ischemic colitis requires angiographic evaluation to assess the patency of the mesenteric arteries. Treatment of occlusive lesions includes anticoagulation, thrombectomy, angioplasty and/or stenting. Hypoperfusion states require treatment with fluids, blood products, or vasopressors. In cases of necrosis or perforation, a bowel resection or partial colectomy may be required.

Incorrect Answers: A, B, D, and E.

Colon cancer (Choice A) would be unlikely in this patient with a negative colonoscopy without polyps or cancers less than 10 years ago.

Diverticulitis (Choice B) presents as infection or inflammation of colonic diverticula, which are small outpouchings of the bowel wall, most commonly located in the sigmoid colon. Diverticulitis presents with acute left lower quadrant abdominal pain, sometimes accompanied by diarrhea, fever, and tenderness to palpation in the left lower quadrant.

Mesenteric venous thrombosis (Choice D) can present similarly and cause ischemic colitis, but typically presents subacutely and is less common than arterial ischemic colitis.

Sigmoid volvulus (Choice E) results from twisting of the sigmoid mesentery, which can lead to large bowel obstruction and perforation or intestinal necrosis if not treated. Patients commonly present with symptoms secondary to a large bowel obstruction such as constipation, abdominal bloating, distension, nausea, and vomiting.

Educational Objective: Ischemic colitis refers to inadequate blood supply to the colon, which can lead to bowel wall necrosis, loss of immune barriers, and bowel perforation. Patients typically present with acute abdominal pain and cramping associated with bloody bowel movements if bowel necrosis has occurred.

21. A 52-year-old woman comes to the emergency department because of a 5-day history of continuous abdominal pain, nausea, and decreased appetite. Nine days ago, she underwent an elective laparoscopic cholecystectomy for symptomatic cholelithiasis. She was discharged from the hospital 7 days ago. Her temperature is 38.2°C (100.8°F), pulse is 108/min, respirations are 20/min, and blood pressure is 102/64 mm Hg. Examination shows jaundice. Abdominal examination shows right upper quadrant tenderness. Bowel sounds are present throughout all quadrants. Laboratory studies show:

Hemoglobin	12.2 g/dL
Hematocrit	36%
Leukocyte count	17,200/mm^3
Serum	
Urea nitrogen	48 mg/dL
Glucose	186 mg/dL
Creatinine	1.5 mg/dL
Total bilirubin	7.2 mg/dL
Alkaline phosphatase	251 U/L
AST	84 U/L

Ultrasonography of the abdomen shows no fluid collections. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the abdomen
B) HIDA scan
C) Endoscopic retrograde cholangiopancreatography
D) Transhepatic cholangiography
E) Exploratory laparotomy

Correct Answer: C.

Cholecystectomy can be complicated by iatrogenic injury to the biliary tree, including bile duct injury, bile leaks, bowel injury, and bleeding. While most biliary leaks are asymptomatic and resolve spontaneously, some are significant, and symptoms usually appear within 10 days postoperatively. Patients can present with fever, abdominal pain, right upper quadrant tenderness, jaundice, and bilious ascites. Laboratory studies may show leukocytosis, abnormal liver function tests, and hyperbilirubinemia. Endoscopic retrograde cholangiopancreatography (ERCP) evaluates the anatomy and patency of the biliary tree through endoscopic canalization of the duodenal ampulla. ERCP is indicated in the evaluation of acute and chronic biliary pathology, where it serves both a diagnostic and therapeutic purpose for post-cholecystectomy biliary leaks and similar biliary tree complications.

Incorrect Answers: A, B, D, and E.

CT scan of the abdomen (Choice A) may be employed in the diagnostic examination for the evaluation of postoperative complications of a prior cholecystectomy, however an ultrasonography that shows no fluid collections likely eliminates the need for a CT scan as a next step in workup.

HIDA scan (Choice B) is used for the diagnosis of acute cholecystitis, incomplete gallbladder emptying, and cholelithiasis. If there is lack of visualization of the gallbladder after administration of the radioactive tracer, this indicates the presence of acute cholecystitis with blockage of the cystic duct secondary to an impacted, non-mobile gallstone. It can also be used to identify a bile leak, but an ERCP is more appropriate since it provides both diagnostic and therapeutic options.

Transhepatic cholangiography (Choice D) is indicated for visualization of the biliary tree to further delineate findings following ERCP or MR cholangiopancreatography, or if prior ERCP was unsuccessful in cannulation of the duodenal papilla. Additionally, this technique can be used for therapeutic placement of biliary drains or stents.

Exploratory laparotomy (Choice E) involves the surgical evaluation of the peritoneal cavity and is commonly employed in the diagnosis and management of abdominal trauma, bowel obstruction, peritonitis, and undifferentiated cases of an acute abdomen. It may be necessary to evaluate or treat postoperative complications, but less invasive means generally precede operative intervention.

Educational Objective: Cholecystectomy can be complicated by bile duct injury and bile leak. ERCP is a diagnostic and therapeutic modality that can be used in the diagnosis and management of this complication.

22. Four days after admission to the hospital for management of cellulitis of the right lower extremity, a 70-year-old woman has an increased serum creatinine concentration. She has type 2 diabetes mellitus. Her medications are glipizide and a multivitamin; she also has received intravenous nafcillin since admission. She is retired from the military. Vital signs are within normal limits. Examination of the trunk shows no abnormalities. There is edema, erythema, and warmth of the right lower extremity. Examination of the left lower extremity shows no abnormalities. On admission, her serum creatinine concentration was 0.9 mg/dL. Today, laboratory studies show:

Hemoglobin	11 g/dL
Hemoglobin A_{1c}	7.5%
Leukocyte count	15,000/mm^3
Segmented neutrophils	75%
Bands	1%
Eosinophils	8%
Lymphocytes	14%
Monocytes	2%
Serum	
K^+	5 mEq/L
Urea nitrogen	60 mg/dL
Creatinine	2.3 mg/dL
Phosphorus	4.3 mg/dL
Albumin	2 g/dL
Cholesterol	250 mg/dL
Urine	
pH	6.00
Protein	trace
RBC	10/hpf
WBC	20–50/hpf
RBC casts	0/lpf
WBC casts	0/lpf

Serum complement concentrations are within the reference ranges. Which of the following is the most appropriate next step in management?

A) Add ciprofloxacin to the medication regimen
B) Add prednisone to the medication regimen
C) Discontinue nafcillin therapy
D) Schedule hemodialysis
E) Continue current medication regimen

Correct Answer: C.

Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, nonsteroidal anti-inflammatory drugs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders such as sarcoidosis and systemic lupus erythematosus. Patients will have a history of medication exposure, and classically present with low grade fever and diffuse rash. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria, hematuria, and eosinophilia. It is characterized by decreased glomerular filtration rate, rising creatinine, and eosinophilic infiltrates seen on the biopsy specimen. Patients may have proteinuria, but typically not to the extent of nephrotic syndrome. AIN can be complicated by acute kidney injury and a decline in kidney function. Treatment of AIN includes supportive care and discontinuing the offending drug when there is one, such as nafcillin in this case.

Incorrect Answers: A, B, D, and E.

Adding ciprofloxacin to the medication regimen (Choice A) would be unlikely to be helpful for this patient's cellulitis. Fluoroquinolone antibiotics include, but are not limited to, ciprofloxacin, ofloxacin, levofloxacin, and moxifloxacin. They are most effective against Gram-negative infections of the respiratory tract, urinary tract, and gastrointestinal tract, and also are used for certain eye and ear infections.

Adding prednisone to the medication regimen (Choice B) would be unlikely to be helpful for this patient's cellulitis. Oral prednisone is indicated in a variety of inflammatory and autoimmune disorders, although in this patient with diabetes mellitus, the adverse effects of weight gain, hyperglycemia, and metabolic syndrome would be deleterious.

Hemodialysis (Choice D) is indicated when acute kidney injury causes severe acidemia, electrolyte disturbances such as hyperkalemia, volume overload, or uremia.

Continuing the current medication regimen (Choice E) would be inappropriate as nafcillin is likely the cause of this patient's AIN and should be discontinued.

Educational Objective: AIN is usually caused by a hypersensitivity reaction to medications (eg, nonsteroidal anti-inflammatory medications, diuretics, and sulfonamides) and is characterized by a rash, increased creatinine, and eosinophilia. Treatment of AIN includes supportive care and discontinuing the offending medication.

23. A 52-year-old woman, gravida 2, para 2, comes to the physician because of increasingly frequent loss of urine during the past 2 years. She often feels an overwhelming urge to void and completely saturates an absorbent pad before reaching the bathroom. The loss of urine occurs most frequently when she steps out of her car. She also awakens three to four times nightly to void. She has not had any loss of urine with coughing or sneezing. She has hypertension treated with a diuretic. Vital signs are within normal limits. Abdominal examination shows no abnormalities. The external genitalia, vagina, and cervix appear normal. The uterus and adnexa are normal to palpation. There is no loss of urine with Valsalva maneuver or with coughing. Her postvoid residual volume is 50 mL. Urinalysis shows no abnormalities. Which of the following is the most likely diagnosis?

A) Overactive bladder with incontinence
B) Overflow incontinence
C) Stress incontinence
D) Urinary tract infection
E) Vesicovaginal fistula

Correct Answer: A.

Urge incontinence most commonly occurs as a result of detrusor hyperreflexia or overactivity. It typically presents with the urge to urinate followed by the leakage of a variable amount of urine. It is most commonly associated with neurologic disorders (eg, multiple sclerosis, spinal stenosis, or spinal cord injuries) but may also be idiopathic. Physical examination and laboratory studies including urinalysis will be unremarkable. Postvoid urinary bladder residual volumes will also be normal. When evaluating incontinence, however, it is important to rule out an associated urinary tract infection, especially when the incontinence is new in onset. This patient, however, has had symptoms for 2 years. Treatment of urge incontinence includes strengthening the pelvic floor, weight loss, minimizing caffeine and alcohol intake, bladder training or timed voiding, and antimuscarinic agents (eg, oxybutynin).

Incorrect Answers: B, C, D, and E.

Overflow incontinence (Choice B) can be caused by underactive or flaccid detrusor muscles or bladder outlet obstruction, resulting in urinary retention, which is evidenced by an increased post-void residual bladder volume. When the intravesical hydrostatic pressure eventually overwhelms the internal and external urinary sphincter closing pressures, the patient will show passive leakage of urine.

Stress incontinence (Choice C) is incontinence that is triggered by an increase in intra-abdominal pressure (eg, lifting, sneezing, Valsalva). Stress incontinence results from urethral hypermobility caused by pelvic floor weakness/prolapse or intrinsic sphincter deficiency. Risk factors include multiple vaginal deliveries, obesity, and prostate surgery.

Urinary tract infection (Choice D) can present with overactive bladder (frequency, urgency, urge incontinence). Patients generally also experience dysuria and suprapubic pain. This patient's urinalysis was negative, essentially ruling out a urinary tract infection.

Vesicovaginal fistulas (Choice E) can be a consequence of gynecologic surgery, pelvic pathology, or radiation therapy. They typically present with painless urinary leakage from the bladder into the vagina and a pool of urine present in the vaginal vault on pelvic examination.

Educational Objective: Urge incontinence presents with urinary urgency and leakage of variable amounts of urine as a result of detrusor hyperreflexia, also known as an overactive bladder.

24. A 32-year-old woman, gravida 2, para 1, at 18 weeks' gestation comes to the office for a routine prenatal visit. She has no history of operative procedures, and pregnancy has been uncomplicated. She has hypothyroidism and asthma. Her medications are levothyroxine, fluticasone, and a prenatal vitamin. Immunizations are up-to-date. Her first pregnancy was uncomplicated and ended in spontaneous vaginal delivery at term 3 years ago. She is married and works as an international airline pilot. Recently, she has made frequent trips to South America and the Pacific Islands for work. Fetal heart rate is 125/min. Examination shows a uterus consistent in size with an 18-week gestation. Fetal anatomic survey shows microcephaly and a clubbed foot. Which of the following is the most appropriate next step in pharmacotherapy?

A) Amphotericin B therapy
B) Famciclovir therapy
C) Folic acid supplementation
D) Immune globulin therapy
E) No pharmacotherapy is indicated

Correct Answer: E.

Zika virus (ZIKV) is a single-stranded RNA virus within the family of flaviviruses and is spread by the *Aedes aegyptus* mosquito in endemic tropical climates, such as Africa, the Pacific islands, and South America. Infection with ZIKV is typically accompanied by non-specific and self-limited symptoms of viral infection, such as fever, malaise, headache, rash, myalgia, and conjunctivitis, although it is frequently asymptomatic. Maternal ZIKV infection during pregnancy may result in congenital Zika syndrome (CZS), which is characterized by microcephaly, central nervous system dysfunction, ophthalmic abnormalities such as macular scarring, fetal growth restriction, contractures, and hypertonia. Risk to the fetus is greatest during the first trimester. Characteristic developmental abnormalities can be detected by ultrasonography. There is currently no available pharmacotherapy for the prevention or treatment of CZS. Following the 2016 ZIKV epidemic, efforts to develop a vaccine were undertaken. As of 2021, several vaccine candidates are currently in clinical trials.

Incorrect Answers: A, B, C, and D.

Amphotericin B (Choice A) is useful for the treatment of severe fungal infections. Fungal infections do not typically cause congenital anomalies or vertical transmission during pregnancy.

Famciclovir (Choice B) is useful for the treatment of congenital herpes infections. Congenital herpes typically presents with meningoencephalitis, cataracts, and vesicular rash, rather than microcephaly.

Folic acid supplementation (Choice C) is useful for the prevention of neural tube defects but is not known to be useful for the treatment of CZS.

Immune globulin therapy (Choice D) has not been demonstrated to be effective in the prevention or treatment of CZS in large trials.

Educational Objective: Maternal ZIKV infection during pregnancy may result in CZS, which is characterized by microcephaly, central nervous system dysfunction, ophthalmic abnormalities such as macular scarring, fetal growth restriction, contractures, and hypertonia. There is currently no available pharmacotherapy for the prevention or treatment of CZS.

25. A 28-year-old woman, gravida 2, para 1, at 12 weeks' gestation comes to the office for her first prenatal visit. She feels well, and pregnancy has been uncomplicated. Her first pregnancy ended in cesarean delivery at 41 weeks' gestation because of an active herpes simplex lesion. The newborn weighed 4763 g (10 lb 8 oz) at birth; growth and development have been appropriate for age. The patient has no other history of serious illness and takes no medications. She has a brother and father with type 2 diabetes mellitus. She is 157 cm (5 ft 2 in) tall. She weighed 86 kg (190 lb) prior to pregnancy; BMI was 35 kg/m^2. She has had a 4.5-kg (10-lb) weight gain during this pregnancy. Vital signs are within normal limits. Examination shows a uterus consistent in size with a 12-week gestation. Pelvic ultrasonography confirms gestational age. Which of the following is the most appropriate screening test for this patient at this visit?

A) Glucose tolerance test

B) Measurement of serum thyroid-stimulating hormone concentration

C) Quadruple screening

D) Serum herpes simplex antibody testing

E) Serum lipid studies

Correct Answer: A.

Maternal glucose tolerance testing is typically performed between 24 and 28 weeks' gestation to screen for gestational diabetes. However, this test can be done at the first prenatal visit if there is suspicion of underlying or preexisting diabetes. The American Diabetes Association and the American College of Obstetricians and Gynecologists recommend early testing in patients that have a BMI ≥25 kg/m^2 in addition to another risk factor, such as first-degree relatives with diabetes mellitus, hypertension, previous macrosomia or gestational diabetes, or a history of impaired glucose tolerance. Gestational or preexisting diabetes mellitus can lead to an increased risk for congenital anomalies, spontaneous abortion and stillbirth, macrosomia, shoulder dystocia, and birth trauma. Neonatal effects of diabetes can include hypoglycemia as a result of a sudden change in the maternal-fetal glucose balance, hyperbilirubinemia, polycythemia, and an increased risk for neonatal respiratory distress syndrome. Therefore, the early recognition of both gestational diabetes and preexisting diabetes mellitus allows for the initiation of appropriate treatment, decreased average blood glucose concentrations, and improved neonatal outcomes.

Incorrect Answers: B, C, D, and E.

Measurement of serum thyroid-stimulating hormone (TSH) concentration (Choice B) is not routinely recommended in pregnant patients. During pregnancy, β-human chorionic gonadotropin weakly stimulates the thyroid to increase triiodothyronine (T_3) and thyroxine (T_4) production, which suppresses TSH concentration. Therefore, TSH concentrations in a patient that is not experiencing symptoms or signs of hypothyroidism or hyperthyroidism may be difficult to interpret and lead to false conclusions.

Quadruple screening (Choice C) includes maternal serum α-fetoprotein, estriol, β-hCG, and inhibin-A. It allows for the assessment of potential fetal abnormalities. However, it is not offered until 15 to 22 weeks' gestation.

Serum herpes simplex antibody testing (Choice D) is not warranted. This patient has previously developed herpes simplex lesions, and antibody testing would offer no further information to guide the management of her pregnancy.

Serum lipid studies (Choice E) are not routinely recommended during pregnancy. While this patient may have increased lipids in the setting of obesity and likely underlying diabetes mellitus, the initiation of statin therapy is often not recommended for patients under 40 years of age. Additionally, statin therapy is contraindicated in pregnancy.

Educational Objective: Undiagnosed pregestational diabetes mellitus should be considered in overweight and obese patients with additional risk factors, such as a family history of diabetes mellitus, previous gestational diabetes or macrosomia, hypertension, or a history of impaired glucose tolerance. These patients should be screened with a glucose tolerance test at their first prenatal visit, as both gestational and pregestational diabetes mellitus can lead to significant maternal and fetal morbidity.

26. One day after uncomplicated spontaneous vaginal delivery of a healthy newborn at term, a 17-year-old patient, gravida 1, para 1, has severe right nipple pain when attempting to breast-feed. She has no history of serious illness, and her only medication is a prenatal vitamin. She is crying and frustrated. Examination of the right nipple shows erythema and no discharge. Examination of the left nipple shows no abnormalities. Which of the following is the most appropriate recommendation for this patient?

A) Acetaminophen therapy before breast-feeding
B) Applying lidocaine over the nipples
C) Bottle-feeding pumped breast milk
D) Repositioning of the infant's mouth
E) Switching to formula feeding

Correct Answer: D.

Nipple pain is frequently encountered in breast-feeding mothers and is a common cause of premature termination of breast-feeding. Pain that begins in the first few days of breast-feeding is most commonly caused by poor latching. Repositioning of the newborn's mouth and education about proper breast-feeding technique can alleviate nipple pain and allow breast-feeding to continue. Breast-feeding should continue first on the unaffected side. Patients who continue to be unable to achieve a proper latch and who continue to have nipple pain may require breast pumping and bottle feeding of pumped milk. Generally, the majority of the nipple and areola should be within the newborn's mouth for both milk delivery and maternal comfort. Lactation consultants should be engaged to assist new breast-feeding mothers and to promote sustained breast-feeding. Mastitis and breast abscess should be ruled out by examination or adjunct studies if indicated.

Incorrect Answers: A, B, C, and E.

Acetaminophen therapy (Choice A) may be a helpful adjunctive therapy to alleviate pain but will not address the underlying cause.

Applying lidocaine over the nipples (Choice B) is usually unnecessary. Topical treatments have not demonstrated superiority to observation alone, although patients may find the application of warm or cool compresses to provide symptomatic relief. Nipples that are cracked or abraded may be treated with a topical antibiotic.

Bottle-feeding pumped breast milk (Choice C) is a reasonable option when a proper latch cannot be achieved even with the use of proper technique. This patient should first be reassured and educated about repositioning the newborn's mouth. If this approach is unsuccessful, a consultation with a lactation specialist and possible pumping may be appropriate.

Switch to formula feeding (Choice E) is not appropriate yet. Breast-feeding is the optimal source of nutrition for the growth and healthy development of infants.

Educational Objective: Nipple pain that begins in the first few days of breast-feeding is most commonly caused by poor latching. Repositioning of the newborn's mouth and education about proper breast-feeding technique can alleviate nipple pain, allow breastfeeding to continue, and prevent premature termination of breastfeeding.

27. A 24-year-old nulligravid college student comes to the emergency department because of a 20-day history of intermittent heavy vaginal bleeding with passage of clots. During this time, she also has had fatigue and light-headedness with no visual changes or headaches. She has no history of easy bruisability. Menarche was at the age of 12 years. During the past 3 years, menses have occurred at irregular 45- to 70-day intervals and last 5 to 7 days. Menses previously occurred at regular 28- to 30-day intervals and lasted 3 to 5 days. She is not sexually active. Her temperature is 37.4°C (99.3°F), pulse is 96/min, respirations are 20/min, and blood pressure is 115/60 mm Hg. Physical examination, including pelvic examination, shows no petechiae or other abnormalities. Her hemoglobin concentration is 8.7 g/dL, and hematocrit is 28%. Which of the following is the most likely cause of this patient's heavy menses?

A) Adenomyosis
B) Anovulation
C) Immune thrombocytopenic purpura
D) Leiomyomata uteri
E) von Willebrand disease

Correct Answer: B.

Anovulation can be caused by pregnancy, polycystic ovary syndrome, abnormalities or immaturity of the hypothalamic-pituitary-ovarian axis, menopause or premature ovarian failure, inadequate nutrition, chromosomal abnormalities, and thyroid disorders. It presents with irregular intervals of menstruation, associated with heavy vaginal bleeding when menses occur caused by persistent endometrial development. Cyclic progesterone therapy is a key treatment in the management of anovulation. Progesterone therapy acts to inhibit follicle-stimulating hormone (FSH) and luteinizing hormone (LH), preventing ovulation, as well as to maintain the endometrial lining and cause its transition to a secretory, rather than proliferative, endometrium. When progesterone is withdrawn, menstruation occurs if the anovulation is caused by an abnormality or irregularity of the hypothalamic-pituitary-ovarian axis, as is often the case in young women. Menstruation will not occur if the abnormal bleeding is caused by a structural abnormality of the uterus or estrogen deficiency.

Incorrect Answers: A, C, D, and E.

Adenomyosis (Choice A) is the presence of glandular endometrial tissue in the myometrium, and generally presents with abnormal uterine bleeding and pelvic pain. It commonly occurs in a multigravid woman, often in her fourth or fifth decade of life. On exam, a large, globular uterus may be palpated. It would be less likely in this young, nulligravid patient.

Immune thrombocytopenic purpura (Choice C) presents with abnormal bleeding and bruising, thrombocytopenia, petechiae, and purpura. While epistaxis is common, severe menstrual bleeding is not. Additionally, this patient has no physical examination findings to suggest immune thrombocytopenic purpura.

Leiomyomata uteri (Choice D), or uterine fibroids, are benign lesions of the uterine myometrium. They often present in middle age patients with abnormal uterine bleeding, pelvic pain or pressure, and an enlarged uterus with irregular contour on physical examination. They would be less likely in this young patient with no physical examination abnormalities.

von Willebrand disease (Choice E) is caused by an absent, deficient, or dysfunctional von Willebrand factor, which puts patients at an increased risk of bleeding. It commonly presents with mucocutaneous bleeding, easy bruising, and prolonged bleeding in response to trauma or surgery. Women can present with heavy menstrual bleeding, although von Willebrand disease would not explain this patient’s irregularly timed menstruation.

Educational Objective: Anovulation is caused by a variety of underlying pathologies but commonly presents with irregular intervals of menstruation associated with heavy vaginal bleeding when menses do occur. Cyclic progesterone therapy can help elucidate the underlying mechanism. When progesterone is withdrawn, menstruation occurs if the anovulation is caused by an abnormality or irregularity of the hypothalamic-pituitary-ovarian axis, as is often the case in young women.

28. A 37-year-old woman comes to the office because of a 2-week history of episodes of anxiety. The anxiety is accompanied by a rapid heartbeat and light-headedness. Pulse is 130/min, and blood pressure is 100/50 mm Hg. Physical examination shows a bilateral hand tremor. Which of the following is the most appropriate next step in management?

A) Advising the patient to increase her fluid and salt intake
B) Citalopram and lorazepam therapy
C) Cognitive behavioral therapy
D) Propranolol therapy
E) Serum thyroid-stimulating hormone concentration

Correct Answer: E.

Serum thyroid-stimulating hormone (TSH) concentration should be ordered for this patient with signs and symptoms of hyperthyroidism, including tachycardia, anxiety, and hand tremor. Hyperthyroidism may occur as a result of toxic multinodular goiter, a toxic thyroid adenoma, as the initial phase in thyroiditis, or as a result of Graves disease. In iodine-sufficient regions of the world, Graves disease is one of the more common causes. Evaluation should initially focus on measuring the TSH concentration in addition to free-thyroxine (T_4) and triiodothyronine (T_3). Low or undetectable levels of TSH and increased levels of T_4 and/or T_3 are consistent with hyperthyroidism. To differentiate between various causes, a radioiodine uptake scan can be helpful as can measurement of the thyroid receptor antibody, which is positive in most patients with Graves disease. While less common, other causes of thyrotoxicosis include amiodarone use, exogenous use of thyroid hormone, or a TSH-producing adenoma. These causes can usually be differentiated from the more common causes of thyrotoxicosis by the pattern of thyroid studies, clinical history, and imaging.

Incorrect Answers: A, B, C, and D.

Advising the patient to increase her fluid and salt intake (Choice A) would be appropriate if she were found to be hypovolemic secondary to poor oral intake, but her other symptoms are more suggestive of thyrotoxicosis.

Citalopram and lorazepam therapy (Choice B) is used for the treatment of generalized anxiety disorder with panic attacks, but this patient's subacute onset of episodic symptoms is more consistent with thyrotoxicosis than panic disorder.

Cognitive behavioral therapy (Choice C) is useful for patients with generalized anxiety disorder and panic attacks, but this patient should first be assessed for the presence of hyperthyroidism or similar medical causes.

Propranolol therapy (Choice D) is appropriate after the diagnosis of hyperthyroidism is made as it can help to alleviate the symptoms of tachycardia and anxiety, but it would be premature to prescribe this medication before making a diagnosis as there may be other causes of tachycardia and lightheadedness (eg, pulmonary embolism) that may be worsened by β-adrenergic blockade.

Educational Objective: Symptoms of thyrotoxicosis include diaphoresis, weight loss, anxiety, palpitations, and tremor. Evaluation should include measurement of the serum TSH along with free-T_4 and/or T_3. In patients with an undetectable TSH, radioactive iodine scans and certain thyroid autoantibodies can be used to differentiate between the various causes of thyrotoxicosis.

29. A 37-year-old man is brought to the emergency department 30 minutes after losing consciousness immediately following a scuba diving session. According to another diver, the patient had a normal descent into the water but shortly after seemed confused and made a rapid ascent. The patient uses high-quality scuba diving equipment and has experience in the sport. He has hypertension controlled with diet and exercise. He does not smoke cigarettes or drink alcohol. The patient is unresponsive to voice and minimally responsive to sternal rub. His temperature is 35°C (95°F), pulse is 100/min, respirations are 20/min, and blood pressure is 100/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 80%. The skin is cyanotic, and the tongue is pale. Scattered crackles are heard bilaterally. Cardiac examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Decompression sickness
B) Fat embolism
C) Hypothermia
D) Oxygen toxicity
E) Pneumothorax
F) Sinus barotrauma

Correct Answer: A.

Decompression sickness is the most likely cause of this patient's hypoxemia and neurologic derangements. Decompression sickness, colloquially referred to as "the bends," may occur in scuba divers after they return to the surface. Compressed air that is breathed while descending causes tissue saturation with oxygen and nitrogen. At depth, the increased atmospheric pressure allows this gas to remain in the tissues, but if divers experience a rapid change in atmospheric pressure as may occur with a rapid ascent, gas from the tissues is released as small bubbles. Depending upon the extent and location of this gas release, patients can present with a range of different symptoms. This patient has evidence of severe decompression sickness with both neurologic and pulmonary symptoms. Neurologic symptoms are believed to result from venous obstruction by precipitated air bubbles and can result in spinal cord syndromes such as paralysis, cerebellar symptoms such as ataxia, or cerebral symptoms such as altered mental status and coma. Pulmonary symptoms include hypoxia, chest pain, dyspnea, and wheezing. Treatment includes intravenous hydration, the use of 100% supplemental oxygen, and emergency hyperbaric (recompression) therapy.

Incorrect Answers: B, C, D, E, and F.

Fat embolism (Choice B) presents with pulmonary or neurologic symptoms typically following a long bone fracture and would not be expected to occur after scuba diving unless other trauma occurred.

Hypothermia (Choice C) can occur in patients diving in cold water or at extreme depths and can result in confusion or coma, but cyanosis and hypoxemia are not an expected component of hypothermia. Additionally, once temperature returns to normal, generally, symptoms resolve. This patient's temperature would be likely to cause mild shivering and minimal, if any, additional symptoms.

Oxygen toxicity (Choice D) can cause seizures but is more often experienced when patients are undergoing treatment in a hyperbaric oxygen chamber. This patient's neurologic symptoms are more consistent with decompression sickness.

Pneumothorax (Choice E) may result from barotrauma while diving, but patients present with absent or reduced breath sounds on one side in addition to hypoxia, chest pain, and respiratory distress. This patient has equal breath sounds bilaterally.

Sinus barotrauma (Choice F) is common in divers and present with sinus pain, congestion, and nasal discharge. It occurs as a result of sinus obstruction from differences in sinus pressure and environmental pressure. It does not present with neurologic or pulmonary complications.

Educational Objective: Decompression sickness results from release of air bubbles from saturated tissues as a diver ascends from depth to the surface. Symptoms of decompression sickness exist on a spectrum and may range from joint pain and pruritus to coma, paralysis, and profound hypoxemia. Treatment is with 100% oxygen and the use of a recompression chamber.

30. An asymptomatic 27-year-old man comes to the physician for a routine health maintenance examination. He has a history of inguinal hernia repair during childhood. He takes no medications. His father died at the age of 42 years of an aortic root dissection, and his paternal grandmother died suddenly at the age of 46 years of unknown causes. He is 188 cm (6 ft 2 in) tall and weighs 85 kg (187 lb); BMI is 24 kg/m^2. His pulse is 76/min and regular, respirations are 12/min, and blood pressure is 130/70 mm Hg. Examination shows a high narrow palate, mild scoliosis, and a pectus excavatum deformity of the chest. His arm span is 196 cm (6 ft 5 in). The joints of the upper and lower extremities are hyperextensible bilaterally. The feet are flat. In addition to echocardiography, which of the following is the most appropriate next step in evaluation?

A) Ophthalmologic examination
B) Renal ultrasonography
C) CT scan of the head
D) Audiometry
E) Upper endoscopy

Correct Answer: A.

This patient's clinical findings of tall stature, a high, narrow palate, scoliosis, pectus excavatum deformity, and hyperextensibility are consistent with a diagnosis of Marfan syndrome. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at increased risk of vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications. Annual ophthalmic examination should also be performed to identify characteristic features, such as ectopia lentis, as well as myopia, iris transillumination defects, iridodinesis, or phacodinesis, and to prevent complications such as cataract, glaucoma, or retinal detachment. Ectopia lentis, or subluxation of the lens, occurs as a result of weakness of the zonular fibers that support the crystalline lens, and typically presents with superotemporal lens dislocation in patients with Marfan syndrome.

Incorrect Answers: B, C, D, and E.

Renal ultrasonography (Choice B) is useful for the evaluation of patients with autosomal dominant polycystic kidney disease, which does not present with tall stature, scoliosis, pectus excavatum or joint hyperextensibility.

CT scan of the head (Choice C) may be useful for identification of Arnold-Chiari malformations, which may be encountered in association with Ehlers Danlos syndrome, but which are not typically observed in patients with Marfan syndrome.

Audiometry (Choice D) is useful for the evaluation of hearing loss that may occur because of Stickler syndrome. While Stickler syndrome also presents with scoliosis and joint hypermobility, it is also typically accompanied by Pierre Robin sequence, and short stature rather than tall stature.

Upper endoscopy (Choice E) is useful for the detection of stomach and small bowel cancer in patients with Lynch syndrome. Patients with Marfan syndrome are not at significantly increased risk of stomach or small bowel cancers.

Educational Objective: Patients with Marfan syndrome are at increased risk of vascular and ophthalmic complications and should undergo annual echocardiography and ophthalmic examination. The most common ocular findings in Marfan syndrome are ectopia lentis, or lens subluxation, which most commonly occurs superotemporally, and myopia.

31. A study is conducted to assess the relationship between cigarette smoking and the development of lung cancer. One thousand participants who smoke cigarettes and 1000 participants who do not smoke are observed for 15 years. The results show:

	Lung Cancer Present	Absent	Total
Cigarette Smokers	30	970	1000
Nonsmokers	3	997	1000
Total	33	1967	2000

Based on these results, which of the following best approximates the attributable risk of cigarette smoking on the development of lung cancer?

A) 0.3%
B) 2.7%
C) 10%
D) 90%
E) 99.7%

Correct Answer: B.

Attributable (excess) risk (AR) describes the risk of developing disease or the outcome under study (in this case, development of lung cancer) that can be attributed to the exposure as compared to the risk that exists without the exposure. AR is calculated as the difference between disease or outcome incidence among those with the exposure and those without the exposure. In biostatistics, the lowercase letters a, b, c, and d are frequently used to represent numbers of patients exposed to a risk, receiving an intervention, or having a disease. The number of persons having the exposure or receiving the intervention who have the disease or condition in question is represented by ‘a’. The number of persons having the exposure or receiving the intervention who do not have the disease or condition in question is represented by ‘b’. The number of persons who do not have the exposure or who do not receive the intervention in question and who do have the disease or condition is represented by ‘c’. The number of persons who do not have the exposure or who do not receive the intervention in question and who do not have the disease is represented by ‘d’. By this convention, the incidence of those with the exposure who developed disease is computed by determining the number of patients with the exposure and who developed disease (a) and dividing it by the total number of patients who were exposed (a + b). The incidence of those without the exposure who developed disease is computed by determining the number of patients without the exposure who developed disease (c) and dividing it by the total number of patients who were not exposed (c +d). AR is defined as AR = (a / (a + b)) - (c / (c + d)). In this scenario, the attributable risk can be determined by (30 /(30 + 970)) – (3 /(3 + 997)) = 30/1000 – 3/1000 = 0.003 – 0.0003 = 0.027, or 2.7%.

Incorrect Answers: A, C, D, and E.

0.3% (Choice A) and 99.7% (Choice E) involve incorrect mathematical assumptions involving the calculations (c /

(c + d)) in the former case or 100 - (c / (c + d)) in the latter case.

10% (Choice C) represents the inverse of the relative risk, or (c / (c + d)) / (a / (a + b)).

90% (Choice D) represents the fraction of patients with lung cancer who smoke, 30/33 = 90%. The correct formula for AR is given above.

Educational Objective: Attributable risk (AR) describes the risk of developing disease or the outcome that can be attributed to the exposure as compared to the risk that exists without the exposure. AR is calculated as the difference between disease or outcome incidence among those with the exposure and those without the exposure.

32. A study is conducted to determine if a hemoglobin A_{1c} greater than 15% predicts diabetic retinopathy. Results show that 88% of all patients with diabetic retinopathy had a hemoglobin A_{1c} greater than 15%. Which of the following is the most accurate interpretation of these results?

A) False-negative rate is 88%
B) False-positive rate is 88%
C) Negative predictive value is 88%
D) Positive predictive value is 88%
E) Power of the study design is 88%
F) Sensitivity is 88%
G) Specificity is 88%

Correct Answer: F.

Sensitivity is the ability of a test to detect a disease if it is present. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (type 2 error). High sensitivity is therefore useful in ruling out a disease. This is because a negative result from a high sensitivity test indicates a very low likelihood that the disease is present. Because of this, high sensitivity tests are useful for screening purposes in which proving the absence of disease and limiting the number of false negative results are of the utmost importance. Sensitivity can be calculated by dividing true positives (TP) by the sum of TP and false negatives (FN), or TP/(TP + FN). In the case of diabetic retinopathy screening, the importance of sensitivity is paramount in preventing loss of sight. A highly sensitive test allows the clinician and the patient to be confident that a negative test means that the patient is disease free. In contrast, a test with poor sensitivity, if negative, does not provide strong evidence or confidence that the patient does not have the disease. In the study described, a hemoglobin A_{1c} greater than 15% was present in 88% (TP) and not present in 12% (FN) of patients with diabetic retinopathy.

Incorrect Answers: A, B, C, D, E, and G.

False-negative rate (Choice A) represents the portion of patients who lack a positive test result but who do have the disease under study. In this scenario, the false negative rate represents the patients with a hemoglobin A_{1c} less than 15% who do have diabetic retinopathy, 12%.

False-positive (FP) rate (Choice B) represents the portion of patients who have a positive test result but who do not have the disease under study. In this scenario, this would represent patients with a hemoglobin A_{1c} greater than 15% who lack diabetic retinopathy. The scenario provides insufficient information for the calculation of the false positive rate.

Negative predictive value (NPV) (Choice C) is the likelihood that a person does not have a disease, given a negative test, and can be calculated as NPV = true negatives (TN)/(TN + FN). The results of this study do not allow a calculation of NPV.

Positive predictive value (PPV) (Choice D) is the likelihood that a person has a disease, given a positive test, and can be calculated as PPV = (TP)/(TP + FP). The results of this study do not allow a calculation of PPV.

Power of the study (Choice E) is dependent upon the number of participants enrolled in the study. The scenario provides insufficient information to allow a calculation of study power.

Specificity (Choice G) is the proportion of people who do not have the disease who test negative and is calculated as TN/(TN + FP). In this scenario, true negatives would represent patients who lack diabetic retinopathy who have a hemoglobin A_{1c} less than 15%. The scenario provides insufficient information for the calculation of specificity.

Educational Objective: Sensitivity can be calculated by dividing true positives (TP) by the sum of TP and false negatives (FN), or TP/(TP + FN). In the study described, a hemoglobin A_{1c} greater than 15% was present in 88% (TP) and not present in 12% (FN) of patients with diabetic retinopathy.

33. A study is planned to compare the efficacy of two sedatives in all children who are receiving mechanical ventilation for respiratory failure in a pediatric intensive care unit. Which of the following is most likely to invalidate the results of the study?

A) Etiology of respiratory failure
B) Inclusion of children with coma
C) Lack of age restriction
D) Severity of respiratory failure
E) Types of mechanical ventilation

Correct Answer: B.

Confounding is a common problem in biostatistical analysis and must be carefully accounted for in the study design. Confounding variables influence both the independent and dependent variables and can lead to false associations if the confounding variable is not evenly distributed in both study groups. In this example, children with coma will manifest a decreased level of consciousness, which would alter the response of these patients to sedative medications, even if no sedative is provided. If the patients with coma are not distributed evenly across the two study groups, this will lead to a false assumption that one drug may be more effective for sedation. It is more appropriate in this context to exclude patients with coma from the design of the study.

Incorrect Answers: A, C, D, and E.

The etiology of respiratory failure (Choice A) or severity of respiratory failure (Choice D) are less likely to impact the response of children to sedatives unless they are accompanied by or are secondary to central nervous system pathology, such as coma.

Lack of age restriction (Choice C) is unlikely to pose a challenge for the design of this study, as sedative medications are generally dosed by weight in pediatric patients.

Types of mechanical ventilation (Choice E), such as volume-controlled or pressure-controlled techniques, are not pertinent to the type of sedation used or the response of the patient to sedation.

Educational Objective: Confounding is a common problem in biostatistical analysis and must be carefully accounted for in the study design. Confounding variables influence both the independent and dependent variables and can lead to false associations if the confounding variable is not evenly distributed in both study groups.

34. Investigators would like to assess the effectiveness of a new drug for the treatment of bacterial meningitis in humans. Previous studies have shown that the drug is effective in treating the disease in laboratory animals. The investigators design a study protocol that includes randomization of participants to an experimental group and a control group. Which of the following is the primary consideration regarding use of placebo for the control group?

A) Patients must be able to opt out if assigned to receive placebo
B) Placebo should be discontinued once verifiable results have been obtained
C) The placebo must undergo a phase 1 clinical trial before being used
D) Use of placebo must be stratified to disease severity
E) Placebo should not be used

Correct Answer: E.

The use of a placebo allows for the concealment of the administration of the experimental drug from the subject or from the clinician and helps demonstrate the efficacy of the experimental drug by accounting for the beneficial effects that the subject may experience secondary to the administration of any intervention by the clinician. While the use of a placebo can lend validity to a well-designed clinical trial, it poses ethical dilemmas when effective treatments exist for the disease under study especially when the natural history of that disease is life-threatening (eg, bacterial meningitis, often fatal). Many researchers advocate that trials be designed to compare the experimental drug against the current standard of care, rather than a placebo. The ethical dilemma is unambigious in situations such as that given here, where an effective, standard treatment regimen exists, and where the administration of a placebo could cause harm or death. In such scenarios, the use of a placebo would be unethical and should be strictly avoided.

Incorrect Answers: A, B, C, and D.

Allowing patients to opt out if assigned to receive placebo (Choice A) does not address the ethical unacceptability of avoiding or delaying the treatment of a patient with bacterial meningitis. A comparison against standard antibiotic treatment is more appropriate.

Discontinuation of the placebo once verifiable results have been obtained (Choice B) is unacceptable, as delaying treatment of a patient with bacterial meningitis may lead to permanent disability or death.

Conducting a phase 1 clinical trial of the placebo (Choice C) is unnecessary. Placebo drugs are simulated treatments that are known to provide no therapeutic value, such as pills containing sugar or injections of saline solution. They do not require clinical trials to demonstrate their safety.

Stratifying the use of placebo to disease severity (Choice D) is not appropriate, as the clinical course of bacterial meningitis is rapidly progressive and often unpredictable; delays in treatment at any severity may cause significant harm to the patient. Additionally, severity in bacterial meningitis is often a function of time course; as initial symptoms are often only headache and fever, whereas fulminant sepsis, Waterhouse-Friedrichsen syndrome, cranial nerve deficits, stroke-like symptoms, herniation, disseminated intravascular coagulopathy, and hydrocephalus are all mid-to-late features in the natural history.

Educational Objective: The use of a placebo may be inappropriate in situations where an effective treatment is known to exist. A placebo should not be used in situations where its use could cause harm. In such circumstances, the experimental drug should be compared to the standard treatment, rather than a placebo.

35. A previously healthy 18-year-old woman comes to the physician because of a lump in her neck that she first noticed 1 month ago. She is otherwise asymptomatic. Examination shows a 3-cm left supraclavicular lymph node that is firm and rubbery. The spleen is palpated 3 cm below the left costal margin. The remainder of the examination shows no abnormalities. Laboratory studies are most likely to show which of the following?

A) Decreased serum potassium concentration
B) Increased erythrocyte count
C) Increased serum calcium concentration
D) Increased serum lactate dehydrogenase activity
E) Increased serum thyroid-stimulating hormone concentration

Correct Answer: D.

Increased serum lactate dehydrogenase (LDH) activity is likely in this patient with supraclavicular lymphadenopathy and splenomegaly, both of which are concerning for Hodgkin lymphoma. Examination of lymph nodes obtained on biopsy usually show Reed-Sternberg cells, which is indicative of Hodgkin lymphoma. Patients frequently present with localized lymphadenopathy or a dominant lymph node mass; concomitant B-symptoms such as fever, malaise, weight loss, and night sweats are frequently, but not always, encountered. Diagnosis involves core biopsy of an accessible lymph node or excisional biopsy to preserve lymph node architecture, followed by either CT scan with contrast or PET to identify the extent of disease. Hodgkin lymphoma is staged differently than other lymphomas and typically has a favorable prognosis. In patients with this disease, laboratory studies often show increased LDH activity and increased erythrocyte sedimentation rate (ESR). Chemotherapy with concurrent radiation depending upon the location and bulkiness of the disease is often curative.

Incorrect Answers: A, B, C, and E.

Decreased serum potassium concentration (Choice A) would not be expected. In some lymphomas with very high cellular turnover, such as aggressive diffuse large B-cell lymphoma or Burkitt lymphoma, increased serum potassium may indicate tumor lysis syndrome.

Increased erythrocyte count (Choice B) is unlikely. Patients with Hodgkin lymphoma are more likely to have a normal or slightly low erythrocyte count.

Increased serum calcium concentration (Choice C) is seen more commonly in solid tumor malignancies that have metastasized to the bone or in cancers that secrete parathyroid hormone related peptide.

Increased serum thyroid-stimulating hormone concentration (Choice E) is unlikely in this patient as she does not exhibit any of the symptoms of hypothyroidism or secondary hyperthyroidism. Additionally, a supraclavicular mass would not be expected.

Educational Objective: Hodgkin lymphoma is characterized by the presence of Reed-Sternberg cells on tissue biopsy. Patients frequently present with a dominant lymph node mass in the neck, supraclavicular region, or chest. B-symptoms or splenomegaly may or may not be present. Increased concentrations of LDH and ESR are frequently encountered.

36. A 37-year-old man is brought to the emergency department by a coworker 30 minutes after the sudden onset of moderately severe chest pain. His coworker reports that he has become increasingly irritable over the past week. He has no history of diabetes mellitus, coronary artery disease, hyperthyroidism, mood disorder, or intravenous drug abuse. He takes no medications. He is physically fit and exercises regularly. His temperature is 37°C (98.6°F), pulse is 110/min, respirations are 18/min, and blood pressure is 160/100 mm Hg. Physical examination shows diaphoresis. He is alert, oriented, hypervigilant, and irritable. His speech is rapid and pressured. He frequently yells at staff to keep away from him because he believes they are trying to kill him. An ECG shows ST-segment elevation across the precordium. Which of the following is the most likely diagnosis?

A) Bipolar disorder
B) Complex partial seizures
C) Delirium
D) Schizoaffective disorder
E) Schizophrenia
F) Substance-induced psychotic disorder

Correct Answer: F.

This patient demonstrates paranoid delusions and signs of stimulant intoxication, a presentation consistent with substance-induced psychotic disorder. Substance-induced psychotic disorder is defined as the presence of delusions or hallucinations that develop during or within a month of substance use or withdrawal. Intoxication with stimulant drugs (eg, cocaine, methamphetamine) commonly leads to psychotic symptoms secondary to an increase in synaptic dopamine in the limbic system. Stimulants also increase synaptic norepinephrine, leading to sympathetic activation. As such, other signs of stimulant intoxication include elevated or irritable mood, pressured speech, tachycardia, hypertension, and additional signs of sympathetic excess (eg, diaphoresis). In severe stimulant intoxication, the combination of increased norepinephrine and the direct effects of stimulants on the vasculature lead to coronary vasospasm, which may present with acute coronary syndrome (as evidenced by this patient's chest pain and ST-segment elevation). Treatment of acute stimulant intoxication is primarily supportive and commonly includes antipsychotic or benzodiazepine medication for agitation.

Incorrect Answers: A, B, C, D, and E.

Bipolar disorder (Choice A) is a mood disorder characterized by acute episodes of hypomania or mania and may include episodes of depression. Schizoaffective disorder (Choice D) and schizophrenia (Choice E) are chronic psychotic disorders that present with hallucinations, delusions, disorganized thinking/behavior, or negative symptoms. By definition, these primary psychiatric disorders cannot be attributable to substances.

Complex partial seizures (Choice B) are characterized by localized motor or sensory symptoms associated with loss of awareness during episodes. This patient demonstrates intact awareness and signs of stimulant intoxication.

Delirium (Choice C) is an acute confusional state typically associated with acute medical illness in older patients. Delirium presents with acute disturbances in awareness, attention, and baseline cognition that fluctuate in severity over the course of the day. This young patient does not possess risk factors for an unprovoked myocardial infarction as the cause of delirium, does not demonstrate a fluctuating course, and illustrates psychotic symptoms rather than cognitive impairment.

Educational Objective: Substance-induced psychotic disorder is defined as the presence of delusions or hallucinations that develop during or within a month of substance use or withdrawal. Intoxication with stimulant drugs (eg, cocaine, methamphetamine) commonly leads to psychotic symptoms and signs of sympathetic activation.

37. A 32-year-old woman is brought to the emergency department 1 hour after an episode of palpitations, sweating, and shortness of breath. The episode occurred while she was at her job working as an administrative assistant. She thought that she was having a heart attack. She reports that her company recently underwent a reorganization, and she has been under increased stress. This is her fourth visit to the emergency department during the past 3 weeks for similar symptoms. At each previous visit, physical examination and laboratory studies showed no abnormalities. Today, her pulse is 88/min, respirations are 17/min, and blood pressure is 130/70 mm Hg. Physical examination shows no abnormalities. On mental status examination, she is tense and fearful. She has a linear thought process. There is no evidence of hallucinations or delusions. Serum cardiac enzyme activity is within the reference range. Her hematocrit is 39%. Pulse oximetry on room air shows an oxygen saturation of 99%. An ECG shows sinus arrhythmia. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Cocaine intoxication
C) Myocardial infarction
D) Panic disorder
E) Thyrotoxicosis
F) Unstable angina pectoris

Correct Answer: D.

Panic attacks feature acute fear or anxiety that peaks within minutes and are associated with four additional physical symptoms or associated mental states. These additional symptoms may include heart palpitations or tachycardia, shortness of breath, chest pain, dizziness, the sensation of choking, gastrointestinal distress, paresthesias, sweating, chills, trembling, derealization, the fear of dying, or the fear of losing control. The pathogenesis involves genetic factors, an anxious temperament, and stressful life events. In patients with an initial episode of panic symptoms, a thorough history and physical examination along with basic laboratory studies and a potential ECG should be performed to exclude medical causes. This patient's sinus arrhythmia is likely physiologically appropriate in the setting of normal vital signs, physical examination, and laboratory testing on previous emergency department visits for similar episodes. Panic disorder is an anxiety disorder characterized by recurrent panic attacks that are unexpected and associated with worry about future panic attacks or avoidance of panic attack triggers. Treatment of panic disorder typically includes antidepressant medication and psychotherapy.

Incorrect Answers: A, B, C, E, and F.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient possesses no recent history of trauma and does not demonstrate intrusive thoughts, avoidance symptoms, or decreased mood.

Cocaine intoxication (Choice B) typically causes elevated mood, pressured speech, tachycardia, hypertension, and other signs of sympathetic overactivation. However, the normal laboratory studies from previous emergency department visits likely included a normal urine toxicology. As well, this patient's episodes of anxiety and sympathetic overactivation correlate with work-related stress, which is more consistent with panic disorder.

Myocardial infarction (Choice C) and unstable angina (Choice F) typically present with chest pain, nausea, dyspnea, anxiety, and diaphoresis that begin during exertion. However, this patient is young and healthy according to previous physical examinations and laboratory studies, making acute coronary syndrome (eg, unstable angina, myocardial infarction) unlikely. Normal cardiac enzymes exclude acute myocardial infarction but not unstable angina. However, an ECG in a patient with unstable angina or acute myocardial infarction would typically show ST segment abnormalities or T wave inversions, neither of which are seen in this example.

Patients with thyrotoxicosis (Choice E), referring to toxic levels of circulating thyroid hormone, typically present with acute anxiety and sympathetic hyperactivity, and may demonstrate exophthalmos, fine hair, and infiltrative dermopathy on physical examination as a result of hyperthyroidism. Anxiety symptoms in the setting of hyperthyroidism are typically more constant and persistent compared to the episodic course of panic disorder.

Educational Objective: Panic attacks feature acute fear or anxiety that peaks within minutes and are associated with four additional physical symptoms (eg, diaphoresis, chest pain, dyspnea) or associated mental states secondary to sympathetic overactivation. Panic disorder is an anxiety disorder characterized by recurrent panic attacks that are unexpected and associated with worry about future panic attacks or avoidance of panic attack triggers.

38. A 42-year-old woman comes to the physician because she has been feeling sad and hopeless for the past 2 weeks. She reports having mood swings several times daily and crying suddenly for no reason. She has had difficulty motivating herself and can work no more than 4 hours daily as a retail salesperson before becoming tired. She has been wondering if her condition is hopeless and if she will ever feel better. One month ago, she had sinusitis that was treated with amoxicillin. At the end of treatment 3 weeks ago, weakness in her right arm developed that was attributed to a postinfectious autoimmune neuropathy. Since then, she has been receiving prednisone therapy. She has no other history of serious medical or psychiatric illness. Vital signs are within normal limits. Physical examination shows no abnormalities. Muscle strength is normal in all extremities. On mental status examination, she is alert and oriented. She has a sad mood and is on the verge of crying several times. Which of the following is the most appropriate next step in management?

A) Begin supportive group psychotherapy

B) Add citalopram to the medication regimen

C) Add clonazepam to the medication regimen

D) Add quetiapine to the medication regimen

E) Increase the dosage of prednisone

Correct Answer: B.

Medication-induced depressive disorder is defined as a prominent and persistent decrease in mood associated with decreased interest in activities that begins during or within a month after use of a medication. Medications that have been associated with depressive disorder include prednisone, interferons, β-adrenergic blockers, and isotretinoin. Management commonly includes discontinuation of the inciting medication. However, psychiatric medications should be strongly considered for patients with severe symptoms and patients who require the inciting medication for other medical conditions. In this patient with an impairing depressive disorder, an antidepressant medication such as citalopram, a selective serotonin reuptake inhibitor (SSRI), should be strongly considered.

Incorrect Answers: A, C, D, and E.

Beginning supportive group psychotherapy (Choice A) is less likely than citalopram to address this patient's depressive disorder, as support group therapy is not a validated therapy for depressive disorders.

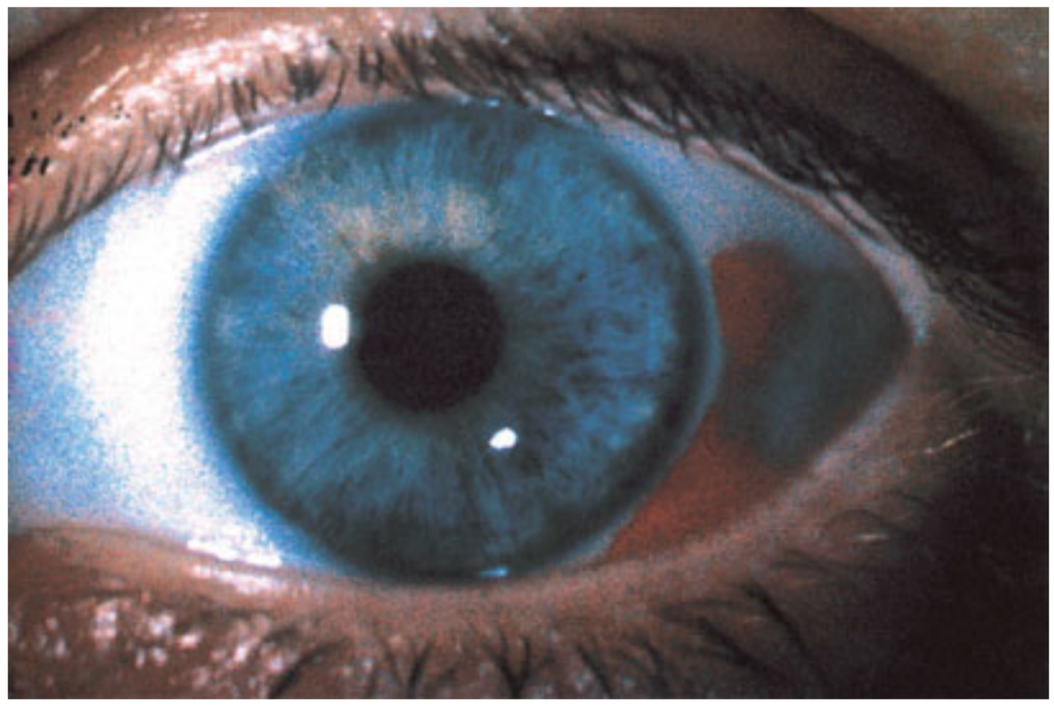
Adding clonazepam to the medication regimen (Choice C) is less likely than citalopram to address this patient's depressive disorder. Clonazepam is a benzodiazepine medication typically utilized for anxiety.

Adding quetiapine to the medication regimen (Choice D) is less likely than citalopram to address this patient's depressive disorder, as SSRIs have more evidence than quetiapine for depressive disorder. As well, quetiapine may cause other adverse effects associated with atypical antipsychotics such as weight gain.

Increasing the dosage of prednisone (Choice E) is not indicated, as the patient's symptoms of neuropathy (the indication for which the medication was initiated) are improved/resolved on examination at this visit. Additionally, it is likely that the prednisone triggered the depressive symptoms, making its use limited by this adverse effect.

Educational Objective: Medication-induced depressive disorder is defined as a prominent and persistent decrease in mood associated with decreased interest in activities that begins during or within a month after use of a medication. Management includes discontinuing the inciting medication and/or initiating a psychiatric medication specific to the patient's psychiatric symptoms.

39. An otherwise healthy 42-year-old woman comes to the physician because her left eye has been red since she awoke 4 hours ago. She has had no changes in her vision and cannot recall any trauma. She takes no medications. Her blood pressure is 110/70 mm Hg. A photograph of the left eye is shown. Her visual acuity is 20/20 in both eyes. Pupils are equal and reactive to light. Ocular movements are full. Visual field testing shows no abnormalities. Which of the following is the most appropriate next step in management?



A) Reassurance
B) Slit-lamp examination
C) Complete blood count
D) Measurement of prothrombin and partial thromboplastin times
E) CT scan of the head
F) Topical methylprednisolone therapy
G) Topical sulfacetamide sodium therapy

Correct Answer: A.

Subconjunctival hemorrhage is a benign occurrence that results from the rupture of capillaries within the conjunctiva, leading to the accumulation of blood between the conjunctiva and the sclera. Capillary rupture often occurs as the result of increased venous pressure caused by coughing, sneezing, vomiting, straining, or heavy lifting. Isolated subconjunctival hemorrhage is analogous to a cutaneous ecchymosis and does not warrant further investigation if sustained in the absence of trauma. Subconjunctival hemorrhage sustained by a blow to the eye may conceal more significant injury to the sclera and warrants examination by an ophthalmologist. Subconjunctival hemorrhages typically resolve without intervention over the course of 1 to 2 weeks.

Incorrect Answers: B, C, D, E, F, and G.

Slit-lamp examination (Choice B) is useful for evaluation of the anterior and posterior segments of the eye; it is useful in a non-ophthalmology setting for diagnosing many acute conditions (including traumatic injury) involving the anterior segment of the eye or to facilitate ocular foreign body removal. A slit-lamp examination is not warranted at this time since the patient reports no trauma to the eye or foreign body sensation.

Complete blood count (Choice C) or measurement of prothrombin and partial thromboplastin times (Choice D) is unnecessary for the evaluation of subconjunctival hemorrhage, which is not commonly associated with thrombocytopenia or coagulopathic states.

CT scan of the head (Choice E) is useful for the identification of orbital wall fractures, which are commonly encountered in association with subconjunctival hemorrhages in the setting of blunt ocular trauma. However, imaging is not warranted in patients who lack a history of trauma.

Topical methylprednisolone therapy (Choice F) is unnecessary and is associated with potential adverse effects, including increased intraocular pressure and secondary glaucoma.

Topical sulfacetamide sodium therapy (Choice G) is useful for the treatment of bacterial conjunctivitis but is unnecessary for the treatment of subconjunctival hemorrhage. Recently, the use of sulfacetamide has been largely supplanted by fluoroquinolone eye drops, such as ofloxacin or moxifloxacin.

Educational Objective: Subconjunctival hemorrhage results from the rupture of capillaries within the conjunctiva, leading to the accumulation of blood between the conjunctiva and the sclera. Subconjunctival hemorrhage is a benign finding that does not warrant further investigation and that typically resolves spontaneously over 1 to 2 weeks.

40. A 43-year-old woman comes to the office because of a 10-year history of enlarging, painless growths on her eyelids. She also has a 1-year history of mild fatigue and occasional bilateral knee pain. She has no history of serious illness and takes no medications. Vital signs are within normal limits. A photograph of the eyelids is shown. The remainder of the examination shows no abnormalities. Which of the following is most likely to confirm the diagnosis?

A) Determination of erythrocyte sedimentation rate
B) Fasting serum lipid studies
C) Measurement of serum thyroid-stimulating hormone concentration
D) Serum antinuclear antibody assay
E) Serum rheumatoid factor assay

Correct Answer: B.

This patient's presentation is consistent with xanthelasma palpebrarum, which are painless periorbital, subcutaneous collections of lipid that are associated with increased serum cholesterol and triglyceride concentrations. The classic presentation includes chronically enlarging, painless growths on the eyelids without other clearly associated features. Xanthelasma, by association with increased serum lipid concentrations, carries an increased risk for atherosclerotic cardiovascular disease. The best next step in such cases is to obtain fasting serum lipid studies for risk stratification to determine the need for initiation of lipid-lowering therapy (eg, statins, fibrates). In general, xanthelasma is diagnosed based on clinical history and physical examination without the need for further studies. On physical examination, xanthelasma typically present as soft, yellowish plaques, generally bilateral, and on the medial side of the upper eyelids. In cases where a differential exists (eg, when the clinician cannot distinguish between xanthelasma and similar lesions such as granulomatous disease, lipoid proteinosis, or sebaceous cystic disease or hyperplasia) a biopsy may be obtained to confirm the diagnosis. Treatment of the xanthelasma is unnecessary unless the lesion is large, functionally impairing the eyelid or eyesight, or if removal is desired for cosmesis.

Incorrect Answers: A, C, D, and E.

Determination of the erythrocyte sedimentation rate (Choice A) would be an appropriate next step if the presentation were concerning for vasculitis, systemic lupus erythematosus (SLE), or a similar inflammatory disease. This patient's benign presentation, chronicity, and lack of clearly associated features makes such a disease unlikely. Xanthelasma is not associated with increased inflammatory markers.

Measurement of serum thyroid-stimulating hormone concentration (Choice C) would be correct in cases of Graves ophthalmopathy, which is characterized by proptosis and lid-lag. Patients generally present with symptoms associated with hyperthyroidism, such as heat intolerance, weight loss, diarrhea, oligo- or amenorrhea, palpitations, and fatigue.

Serum antinuclear antibody assay (Choice D) would be a sensitive test for SLE among other inflammatory and rheumatologic conditions in which it may be detectable (eg, rheumatoid arthritis). SLE presents with multiple symptoms across organ systems, including malar rash, photosensitivity, arthritis, nephritis, and cytopenias.

Serum rheumatoid factor assay (Choice E) is an appropriate test in cases of suspected rheumatoid arthritis, which presents with chronic joint pain and inflammation, often initially involving the metacarpophalangeal and proximal interphalangeal joints of the hands. Skin changes can occur, such as subcutaneous rheumatoid nodules, however xanthelasma are not generally observed in association with rheumatoid arthritis.

Educational Objective: Xanthelasma palpebrarum are painless periorbital, subcutaneous collections of lipid that are associated with increased serum cholesterol and triglyceride concentrations. As a result of the increased risk for atherosclerotic cardiovascular disease, fasting serum lipid studies should be measured and treatment initiated if a significantly increased risk for cardiovascular disease is present.

41. A 52-year-old man is brought to the physician because of a 2-day history of pain at the base of his scrotum, fever, and confusion. He has type 2 diabetes mellitus poorly controlled with insulin. He has no other history of serious illness. He appears lethargic. He is oriented to person but not to place or time. His temperature is 39.2°C (102.6°F), pulse is 120/min, and blood pressure is 118/78 mm Hg. Examination of the scrotum shows several bullae over the scrotum and crepitus of the perineum. The scrotum is edematous and tender. The remainder of the examination shows no abnormalities. His leukocyte count is 16,000/mm^3 with a left shift, and serum glucose concentration is 415 mg/dL. In addition to insulin and antibiotic therapy, which of the following is the most appropriate next step in management?

A) Culture of bullae
B) CT scan of the pelvis
C) Hyperbaric oxygen therapy
D) Surgical debridement
E) No further management is indicated at this time

Correct Answer: D.

A perineal abscess, presenting as an erythematous, edematous, tender, cystic mass of the perineum, can be complicated by necrotizing fasciitis if left untreated. Necrotizing fasciitis is a severe bacterial infection involving the fascial plane between skin and muscle, most commonly caused by mixed anaerobic and aerobic bacteria. It classically presents with erythema or a purple discoloration to the skin, bullae, tenderness out of proportion to exam, and crepitus to palpation. It spreads along the deep fascial plane causing rapid extension of the infection which is often difficult to appreciate visually. Vital signs may demonstrate fever, tachycardia, and hypotension. Risk factors include previous trauma to the infected site, as well as systemic diseases such as diabetes mellitus, kidney failure, and liver failure. Necrotizing fasciitis is a surgical emergency and requires immediate surgical debridement, broad spectrum antibiotics, and fluid resuscitation. When occurring in the perineum, it is known as Fournier gangrene.

Incorrect Answers: A, B, C, and E.

Culture of bullae (Choice A) would take at least 24 to 48 hours and may not be sensitive in identifying the organism responsible for the necrotizing fasciitis. Necrotizing fasciitis is a clinical diagnosis that requires emergency broad-spectrum antibiotics and surgical debridement without delay.

CT scan of the pelvis (Choice B) can help with diagnosis of necrotizing fasciitis, but it is a clinical diagnosis with signs and symptoms including erythema or a purple discoloration to the skin, bullae, tenderness out of proportion to exam, crepitus to palpation, and fever.

Hyperbaric oxygen therapy (Choice C) has been shown to be helpful in the treatment of necrotizing fasciitis as an adjunct to broad-spectrum antibiotics and surgical debridement. However, surgical debridement remains the most important step in the treatment of necrotizing fasciitis.

No further management (Choice E) is inappropriate as necrotizing fasciitis is a condition with high morbidity and mortality that requires emergent antibiotics and surgical debridement.

Educational Objective: Necrotizing fasciitis is a severe infection of the deep fascial planes of tissue, presenting with erythema, tenderness to palpation, and rapid expansion leading to bullae formation, purple discoloration, and crepitus. Risk factors include systemic diseases such as diabetes mellitus, liver failure, and kidney failure. Treatment includes emergency surgical debridement and broad-spectrum antibiotics.

42. A 4-year-old boy is brought to the emergency department by his parents because of a 2-day history of increasingly severe pain in his right leg with an associated limp. He has not fallen or sustained any trauma. One week ago, he was treated with amoxicillin for a middle ear infection. He has no history of serious illness and currently takes no medications. He is at the 50th percentile for height and weight. Vital signs are within normal limits. On examination, the patient holds the right hip flexed and externally rotated. Passive range of motion of the right hip is limited by pain. An x-ray of the right hip shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the right hip

B) Measurement of serum inflammatory markers

C) Serum rheumatoid factor assay

D) Technetium 99m bone scan

E) X-ray of the right knee

Correct Answer: B.

The most likely diagnosis in this otherwise healthy patient is transient synovitis of the hip. Transient synovitis is an inflammatory condition involving the synovial lining of weight-bearing joints, with the hip being commonly affected. It classically presents in children recovering from a viral infection with pain on weight-bearing, antalgic gait, refusal to ambulate, tenderness over the joint, and pain elicited with range of motion. Vital signs are generally within normal limits, as are laboratory studies with the exception of increased markers of inflammation such as erythrocyte sedimentation rate. Antecedent viral infection has been reported in up to 30% of cases of transient synovitis. Diagnosis involves the exclusion of emergent or urgent conditions such as cellulitis, septic arthritis, osteomyelitis, and fracture. Treatment is supportive, and involves rest plus nonsteroidal anti-inflammatory medications, making oral ibuprofen the best choice for this patient. If there is diagnostic uncertainty, arthrocentesis to exclude septic arthritis, along with imaging to assess for osteomyelitis or fracture should be conducted.

Incorrect Answers: A, C, D, and E.

CT scan of the right hip (Choice A) would be more sensitive in the evaluation for fractures. However, in young patients without a history of falls or trauma, a hip or pelvic fracture would be unlikely. CT scan to evaluate for subtle fractures can be helpful in elderly patients with osteopenia and equivocal x-rays.

Serum rheumatoid factor assay (Choice C) can be helpful in the diagnosis of juvenile idiopathic arthritis. It has an autoimmune cause and is characterized by joint pain and inflammation. Patients also commonly exhibit extra-articular manifestations such as uveitis, lymphadenopathy, and rash.

Technetium 99m bone scan (Choice D) can be helpful in the diagnosis of osteomyelitis. Osteomyelitis is an infection of the bone or bone marrow that may be caused by direct local spread of an infection or hematogenous seeding from a distal site. Patients present with fever, localized pain and inflammation, inability to bear weight, and increased inflammatory markers. Bone scintigraphy with the radiotracer technetium 99m may show increased uptake in the area of infection.

X-ray of the right knee (Choice E) would be unlikely to be helpful in this patient. The patient's pain and limited range of motion is located at the right hip, raising concern for transient synovitis. X-rays can evaluate best for fractures, which would be unlikely in a patient without a history of falls or trauma.

Educational Objective: Transient synovitis is a non-infectious arthropathy that presents with pain of weight-bearing joints, often the hip, frequently following a viral infection in a child. Diagnosis involves the exclusion of emergent or urgent conditions such as cellulitis, septic arthritis, osteomyelitis, and fracture. It is best managed with non-steroidal anti-inflammatory medications.

43. A 62-year-old man with a 6-month history of poorly controlled hypertension comes to the office for a follow-up examination. His blood pressure measurements 1 year ago averaged 140/90 mm Hg; at that time, he was treated with hydrochlorothiazide. He is now taking the maximum doses of enalapril, metoprolol, and hydrochlorothiazide. He also has peripheral vascular disease. His blood pressure today is 170/110 mm Hg. Examination shows narrowing of the retinal arterioles. The lungs are clear to auscultation. Cardiac examination shows an S_4 at the lower left sternal border. The abdomen is nontender, and a systolic bruit is heard just to the right of the umbilicus. The dorsalis pedis and posterior tibialis pulses are absent bilaterally; there is no lower extremity edema. Laboratory studies show:

Serum	
K^+	3.6 mEq/L
Urea nitrogen	25 mg/dL
Creatinine	1.1 mg/dL
Urine	
Protein	1+
RBC	none
WBC	none

Which of the following is the most appropriate next step in management?

A) Intravenous pyelography
B) Measurement of peripheral plasma renin activity
C) Measurement of urine catecholamine concentration
D) MR angiography of the renal arteries
E) Kidney biopsy

Correct Answer: D.

Renal artery stenosis is a cause of secondary hypertension related to activation of the renin-angiotensin-aldosterone system. Low afferent blood flow to the affected kidney leads to abnormal stimulation of the juxtaglomerular apparatus and excessive production of renin. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme (ACE) in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension. Angiotensin II also leads to increased Na^+ reabsorption in the renal tubules, aldosterone release by the adrenal cortex with subsequent increased Na^+ and fluid retention and hypokalemia, vasopressin release from the posterior pituitary leading to increased fluid retention, enhanced adrenergic function through inhibition of norepinephrine reuptake in sympathetic nerve endings, and stimulation of hypothalamic thirst centers. In younger patients, fibromuscular dysplasia is the most common cause of renal artery stenosis, while in older patients it is typically caused by atherosclerosis. An abdominal bruit may be appreciated in the region of the stenosis. Renal vein sampling may detect increased renin levels on the affected side. Diagnosis is established with renal artery Doppler ultrasonography or MR angiography, which are able to quantify the degree of renal artery stenosis and associated renal atrophy. Treatment involves angioplasty or stenting of the stenosed renal artery to improve flow. ACE inhibitors can be considered for unilateral stenosis but can lead to acute kidney failure in the setting of bilateral renal artery stenosis.

Incorrect Answers: A, B, C, and E.

Intravenous pyelography (Choice A) involves the intravenous injection of a radio-opaque contrast to subsequently visualize the ureters and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures.

Measurement of peripheral plasma renin activity (Choice B) is done as a part of the investigation for hyperaldosteronism. Hyperaldosteronism is also a cause of secondary hypertension. Excess aldosterone production from an adrenal adenoma or bilateral adrenal hyperplasia causes hypertension from salt and water retention, along with hypokalemia and metabolic alkalosis. Diagnosis is made by measuring serum renin and aldosterone, which demonstrates an abnormally high aldosterone and undetectable renin concentration.

Pheochromocytoma is a rare catecholamine-secreting tumor and typically presents with episodic headaches, diaphoresis, tachycardia, and hypertension. Measurement of urine catecholamine concentration (Choice C) is performed as part of the diagnostic evaluation for a pheochromocytoma.

Kidney biopsy (Choice E) is helpful in the diagnosis of nephrotic and nephritic syndromes, which can present with proteinuria and hematuria as well as signs and symptoms of volume overload and peripheral edema. This patient's most likely cause of hypertension is renovascular hypertension, which is diagnosed with MR angiography of the renal arteries.

Educational Objective: Renal artery stenosis is a cause of secondary hypertension caused by abnormal activation of the renin-angiotensin-aldosterone system. Diagnosis is established with renal artery Doppler ultrasonography or MR angiography, which are able to quantify the degree of renal artery stenosis and associated kidney atrophy.

44. Twelve hours after delivery, a newborn is cyanotic and in respiratory distress. He was born at term to a 27-year-old woman, gravida 2, para 1, following an uncomplicated pregnancy; he weighed 3317 g (7 lb 5 oz). Delivery was complicated by meconium aspiration, and the trachea was suctioned at birth. Apgar scores were 3, 5, and 8 at 1, 5, and 10 minutes, respectively. His temperature is 37.2°C (99°F), pulse is 170/min, respirations are 70/min, and blood pressure is 70/50 mm Hg. Examination shows labored breathing with grunting, nasal flaring, and subcostal and intercostal retractions. The lungs are clear to auscultation. A loud S_2 is heard. An x-ray of the chest shows small scattered infiltrates in the lung fields and a normal cardiac silhouette. An ECG shows no abnormalities. Which of the following is the most likely explanation for this patient's respiratory distress?

A) Congenital cystic adenomatoid malformation

B) Left-to-right cardiac shunting

C) Pneumothorax

D) Premature closure of the ductus arteriosus

E) Pulmonary hypertension

Correct Answer: E.

Pulmonary hypertension is the most likely explanation of this patient's respiratory distress. Neonatal pulmonary hypertension may occur as a result of inadequate development of the pulmonary vascular bed leading to a fixed increase in pulmonary vascular resistance (PVR), improper development of the pulmonary vasculature from over-perfusion of the fetal lung as may occur with premature closure of the ductus arteriosus or with total anomalous pulmonary venous drainage. It may also occur in patients with normal pulmonary vascular development who experience another insult at birth leading to a failure to decrease the PVR upon exposure to increased oxygen tension. In the latter case, this may occur as a result of meconium aspiration or systemic infection. Normal fetal circulation is unique in that oxygenated blood arrives from the maternal circulation via the umbilical vein and reaches the inferior vena cava directly. From there, oxygenated blood is shunted from the right atrium to the left atrium, to the left ventricle, and then to the systemic circulation. Oxygenated blood that reaches the right ventricle and the pulmonary arteries is shunted through the ductus arteriosus to the aortic arch. Before birth, the fetal lungs are filled with amniotic fluid and the pulmonary vascular resistance (PVR) is high. Under normal circumstances, the first breath leads to a decrease in PVR as pulmonary vessels dilate. Peripartum asphyxia, which may occur secondary to meconium aspiration impairs the normal transition from a high to low PVR state. Despite adequate delivery of oxygen after intubation, a persistently increased PVR impairs oxygenation.

Incorrect Answers: A, B, C, and D.

Congenital cystic adenomatoid malformation (Choice A) can either be asymptomatic or symptomatic at birth. It may present with respiratory distress, but a loud S_2 would not be expected.

Left-to-right cardiac shunting (Choice B) can occur as a result of a patent foramen ovale or a ventricular septal defect, which allows oxygenated blood to re-enter the pulmonary vasculature. This would not typically result in respiratory distress.

Pneumothorax (Choice C) has effectively been ruled out as the chest x-ray is normal.

Premature closure of the ductus arteriosus (Choice D) can result in neonatal pulmonary hypertension, but this patient's pulmonary hypertension is more likely secondary to meconium aspiration.

Educational Objective: Pulmonary hypertension of the newborn may occur as a result of congenital malformations that directly impair the development of the pulmonary vascular bed, alterations of the normal fetal circulation in utero, or perinatal complications such as meconium aspiration that prevent the normal transition from a high resistance to a low resistance pulmonary circuit. This leads to hypoxemia and respiratory distress.

45. A 32-year-old primigravid woman at 16 weeks' gestation is brought to the emergency department 30 minutes after the onset of heavy vaginal bleeding, palpitations, and moderate headache. Her temperature is 37°C (98.6°F), pulse is 110/min, respirations are 18/min, and blood pressure is 150/100 mm Hg. She appears flushed and anxious. The uterus is consistent in size with a 20-week gestation. No fetal heart tones are heard. Urinalysis shows 2+ protein. Ultrasonography shows a uterus with a cystic appearance and 10-cm, cystic adnexal masses bilaterally. Which of the following is the most appropriate next step in management?

A) Oral administration of misoprostol

B) Intramuscular administration of methotrexate

C) Dilatation and suction evacuation

D) Exploratory laparotomy and bilateral ovarian cystectomies

E) Operative laparoscopy and bilateral ovarian cystectomies

Correct Answer: C.

Hydatidiform moles are either caused by the fertilization of an empty egg by a single sperm followed by duplication of the paternal DNA resulting in 46 chromosomes (complete) or the dual fertilization of a normal ovum resulting in 69 chromosomes (partial). They can present with first trimester vaginal bleeding, early preeclampsia, and uterine size greater than expected for dates. Maternal symptoms may also include hyperemesis gravidarum related to abnormally increased human chorionic gonadotropin (hCG) concentrations. Complete moles contain no fetal tissue, while partial moles contain some fetal tissue, but neither are viable, and no fetal heartbeat will be found on Doppler ultrasonography. Pelvic examination may demonstrate cystic molar clusters in the vagina, and laboratory evaluation will show abnormally increased β-hCG concentrations. Ultrasonography of the pelvis will also often show bilateral multilocular ovarian cysts (theca-lutein cysts) and abnormal echogenicity in the uterus (hydatidiform mole), as seen in this patient. Hydatidiform moles are treated with dilation and curettage or suction evacuation, followed by appropriate contraception and the sequential measurement of β-hCG to monitor for the development of malignant gestational trophoblastic diseases such as an invasive mole or choriocarcinoma. These malignant diseases are treated with chemotherapy.

Incorrect Answers: A, B, D, and E.

Oral administration of misoprostol (Choice A) is often used in the elective termination of pregnancies, alone or in combination with mifepristone. It can also be used to ripen the cervix for induction of labor in term pregnancies or to allow the passage of fetal tissue in miscarriages. However, it plays no role in the management of hydatidiform moles.

Intramuscular administration of methotrexate (Choice B) can be used to treat small, early ectopic pregnancies and gestational trophoblastic diseases, such as choriocarcinoma. It can also be used in the elective termination of pregnancy. The next most appropriate step in this patient, though, is to remove the hydatidiform mole with dilatation and curettage or suction evacuation.

Exploratory laparotomy and bilateral ovarian cystectomies (Choice D), as well as operative laparoscopy and bilateral ovarian cystectomies (Choice E), may be utilized in the management of symptomatic ovarian cysts or ovarian cysts leading to ovarian torsion. However, these procedures would not allow the hydatidiform mole to be removed from the uterus, which is the most important aspect of this patient's care.

Educational Objective: Hydatidiform moles commonly present with persistent nausea and vomiting, first trimester vaginal bleeding, early preeclampsia, and uterine size out of proportion to the expected gestational age. β-hCG will be markedly increased, and ultrasonography will show abnormal echogenicity in the uterus and ovarian theca-lutein cysts. Treatment includes dilatation and curettage or suction evacuation, followed by appropriate contraception and the sequential measurement of β-hCG to monitor for the development of malignant gestational trophoblastic diseases such as an invasive mole or choriocarcinoma.

46. A 57-year-old woman comes to the physician because of vaginal bleeding for 10 days. Her last menstrual period was 9 years ago. She is not receiving hormone replacement therapy. She is 170 cm (5 ft 7 in) tall and weighs 85 kg (188 lb); BMI is 29 kg/m^2. Examination shows no other abnormalities. Transvaginal ultrasonography shows a 2.5-cm subserosal leiomyoma uteri and an 18-mm endometrium. There are no ovarian abnormalities. Which of the following is the most appropriate next step in management?

A) Hormone replacement therapy
B) Endometrial sampling
C) Endometrial ablation
D) Myomectomy
E) Hysterectomy

Correct Answer: B.

Vaginal bleeding in a postmenopausal woman should raise suspicion for malignancy, including endometrial, uterine, or ovarian carcinoma. Of these, endometrial carcinoma is the most common malignancy in these patients, although other causes of postmenopausal bleeding also include vaginal or endometrial atrophy, polyps, and leiomyomata uteri. This patient has a subserosal leiomyoma uteri, which is less likely to cause uterine bleeding than a submucosal or intracavitary leiomyoma uteri. Additionally, this patient has a markedly thickened endometrium (normal thickness is 4 mm or less in a postmenopausal woman), which further raises the suspicion for endometrial cancer. Thus, she should undergo endometrial sampling to evaluate for endometrial cancer. Risk factors for the development of endometrial cancer include obesity, unopposed or prolonged estrogen exposure (eg, tamoxifen use, early menarche, late menopause, nulliparity), diabetes mellitus, hypertension, and a family history of the disease. If confirmed by histological studies, treatment includes hysterectomy, often with bilateral salpingo-oophorectomy, followed by adjuvant chemotherapy for advanced disease.

Incorrect Answers: A, C, D, and E.

Hormone replacement therapy (Choice A) refers to the use of exogenous estrogen for the management of symptoms of menopause. Unopposed, exogenous estrogen further increases the risk of endometrial hyperplasia and carcinoma, which would be inappropriate in this patient who has evidence of a thickened endometrial stripe on ultrasonography.

Endometrial ablation (Choice C) can be used in the management of menorrhagia in premenopausal patients. It is not recommended for patients that are postmenopausal and is contraindicated in patients with confirmed or suspected endometrial hyperplasia or carcinoma, as it may interfere with further evaluation. All patients should have an endometrial biopsy prior to undergoing endometrial ablation.

Myomectomy (Choice D) may be used to remove this patient's leiomyoma uteri. However, this leiomyoma uteri is unlikely to be contributing significantly to her postmenopausal bleeding as it subserosal, rather than submucosal, which leads to less disruption of the endometrial cavity. Additionally, myomectomy would not offer evaluation of the endometrium for hyperplasia or carcinoma.

Hysterectomy (Choice E) may be warranted in this patient. However, pursuing hysterectomy prior to confirming a diagnosis of endometrial carcinoma would be inappropriate.

Educational Objective: Postmenopausal vaginal bleeding should raise suspicion for endometrial carcinoma, particularly in patients that have risk factors for it, such as obesity, family history, unopposed or prolonged estrogen exposure, diabetes mellitus, and hypertension. Evaluation includes endometrial sampling, particularly when the endometrial lining is greater than 4 mm in thickness. Treatment includes hysterectomy and adjuvant chemotherapy for advanced disease.

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47. A 52-year-old woman with type 2 diabetes mellitus is brought to the emergency department by her family 24 hours after the onset of vomiting. She has not taken any medications during this period and has become confused during the past 4 hours. She has not had fever or any other symptoms. Her diabetes has been complicated by neuropathy, retinopathy, gastroparesis, and nephropathy. Her prescribed medications include short- and intermediate-acting insulin and gabapentin. She also takes aspirin as needed for headache. On arrival, she is oriented to person but not to place or time. Her temperature is 37.2°C (98.9°F), pulse is 110/min, respirations are 16/min, and blood pressure is 112/78 mm Hg. Examination, including neurologic examination, shows no other abnormalities. Laboratory studies show:

Hemoglobin	14.1 g/dL
Leukocyte count	14,200/mm^3
Segmented neutrophils	90%
Bands	4%
Eosinophils	1%
Lymphocytes	3%
Monocytes	2%
Platelet count	240,000/mm^3
Serum	
Na^+	127 mEq/L
K^+	4.2 mEq/L
Cl^-	98 mEq/L
HCO_3^-	22 mEq/L
Urea nitrogen	36 mg/dL
Glucose	890 mg/dL
Creatinine	2.6 mg/dL

Arterial blood gas analysis on room air shows:

pH	7.35
Pco_2	37 mm Hg
Po_2	100 mm Hg

Which of the following is the most likely cause of this patient's confusion?

A) Aspirin overdose
B) Hyperosmolality
C) Hyponatremia
D) Ketoacidosis
E) Lactic acidosis

Correct Answer: B.

Hyperosmolar hyperglycemic state (HHS) is the most likely disease process that explains this patient's altered mental status. HHS, in addition to diabetic ketoacidosis (DKA), are two of the most severe, acute complications of diabetes mellitus and are usually precipitated by a failure to appropriately take medications, or by conditions such as pregnancy, myocardial infarction, alcohol intoxication, or sepsis. Both syndromes result from a mismatch between insulin production and insulin requirements. DKA is more common in patients with type 1 diabetes mellitus with complete insulin deficiency and presents with more modest hyperglycemia and profound ketoacidosis. HHS is more common in patients with poorly controlled type 2 diabetes mellitus and relative insulin deficiency. Patients with HHS do not demonstrate evidence of ketosis because the remaining limited basal insulin secretion is typically sufficient to avoid profound ketogenesis, but these patients are more likely to present with severe hyperglycemia and neurologic symptoms as a result of markedly increased serum osmolality. Glucose is an osmotically active compound and contributes to profound volume depletion in patients with HHS. The subsequent hyperosmolar state that results from such substantial loss of free water can result in neurologic complications including confusion, coma, or even focal neurologic deficits. Laboratory studies may also show pseudohyponatremia and kidney dysfunction from pre-renal azotemia. Treatment should focus on volume repletion, restoration of euglycemia with close monitoring of electrolytes, insulin administration, and careful attention to airway protection.

Incorrect Answers: A, C, D, and E.

Aspirin overdose (Choice A) results in a mixed acid-base disorder marked by a metabolic acidosis with a respiratory alkalosis. This patient does not have a clinical history or laboratory studies to support this diagnosis.

Hyponatremia (Choice C) can result in neurologic deficits but usually occurs when the serum sodium concentration is less than 120 mEq/L. Additionally, this patient is more likely to have pseudohyponatremia as a result of profound hyperglycemia.

Ketoacidosis (Choice D) is found in patients with DKA and would present with a low bicarbonate concentration and a low pH. Ketones can also be detected in the serum and urine. This patient's serum bicarbonate concentration and pH are only marginally low and not consistent with ketoacidosis.

Lactic acidosis (Choice E) presents with an anion gap, low pH, and increased lactate concentration. This patient's laboratory findings do not fit with this diagnosis.

Educational Objective: HHS is an acute complication of poorly controlled diabetes mellitus, often precipitated by medication non-adherence, infection, myocardial infarction, or dehydration. It presents with profound hyperglycemia in the absence of ketosis, and markedly increased serum osmolality, which can result in neurologic complications ranging from altered mental status to coma.

48. Six hours after undergoing surgical excision of the distal colon for cancer, a 77-year-old man has decreased urine output. His urine output has been 10 mL/h during the past 3 hours. During the 4-hour operation, he lost 500 mL of blood and underwent transfusion of 1 unit of packed red blood cells. His initial postoperative course was uncomplicated. Two years ago, he had a myocardial infarction and underwent coronary artery bypass grafting. He has a 10-year history of hypertension well controlled with atenolol. Current medications include morphine and labetalol. He currently appears pale and diaphoretic. His temperature is 37°C (98.6°F), pulse is 85/min, respirations are 14/min, and blood pressure is 90/60 mm Hg. Pulse oximetry on 2 L/min of oxygen via nasal cannula shows an oxygen saturation of 89%. Cardiopulmonary examination shows no abnormalities. The abdomen is nondistended with mild tenderness over the incision. His hematocrit is 24%, serum sodium concentration is 140 mEq/L, and serum creatinine concentration is 2.1 mg/dL. The patient is switched to administration of 100% oxygen by a nonrebreathing face mask. The most appropriate next step in management is administration of which of the following?

A) Bumetanide
B) 5% Dextrose in water
C) Fresh frozen plasma
D) Furosemide
E) Packed red blood cells
F) 0.45% Saline

Correct Answer: E.

Packed red blood cell (pRBC) transfusion is the most appropriate next step in management of this patient with anemia, hypoxia, and oliguria. This patient has suffered extensive blood loss during his surgery and now has hypoxia and an acute kidney injury with decreased urine output. His hematocrit of 24% correlates roughly with a hemoglobin concentration of approximately 8 mg/dL. Given the acuity of his blood loss, it is likely that his true hemoglobin concentration is lower. The typical transfusion threshold for medically stable patients with anemia is a hemoglobin concentration of 7 mg/dL or below, but in patients with acute blood loss and signs of end organ perfusion deficits such as oliguria, increased creatinine, and hypoxemia, consideration should be given to transfusing pRBCs at a higher hemoglobin threshold. Transfusion is more likely to result in the restoration of intravascular volume, normal kidney function, and tissue oxygenation for this patient than crystalloid solutions such as normal saline or lactated Ringer solution.

Incorrect Answers: A, B, C, D, and F.

Bumetanide (Choice A) is a diuretic that is used to treat patients who are hypervolemic. While hypervolemia with pulmonary edema can lead to hypoxia, this patient's recent blood loss suggests that he is hypovolemic, not hypervolemic. Similarly, furosemide (Choice D) is also a diuretic and would likely worsen this patient's symptoms.

5% Dextrose in water (D5W) (Choice B) can be used for volume resuscitation in specific situations but is more likely to cause hyperglycemia than other crystalloids. Additionally, this patient requires pRBCs to increase his oxygen carrying capacity, and fluids such as D5W and 0.45% saline (Choice F) do not provide that benefit. Hypotonic solutions also result in extravasation of free fluid, which may result in tissue edema without a change in intravascular volume after equilibration.

Fresh frozen plasma (Choice C) contains clotting factors in addition to fibrinogen, antithrombin III, and other plasma proteins. It has traditionally been used to replace clotting factors in a variety of coagulant deficient diseases, such as disseminated intravascular coagulation, but the use of cryoprecipitate and/or prothrombin complex concentrates have largely supplanted its use. It would not be beneficial in this patient.

Educational Objective: Although the typical transfusion threshold for pRBCs is a hemoglobin concentration of 7 mg/dL or less, patients with acute blood loss and evidence of end-organ dysfunction such as oliguria or hypoxia should receive pRBCs even if the hemoglobin concentration is above this threshold.

49. A 27-year-old man comes to the physician because of a 4-day history of pain and fullness in his left testicle and a 2-day history of mild pain with urination. He has been sexually active with one female sexual partner for the past 2 years. Examination shows mild left testicular and scrotal tenderness with no redness or edema. Urinalysis shows 3–5 WBC/hpf but no obvious organisms. Which of the following is the most likely causal organism?

A) *Candida albicans*
B) *Chlamydia trachomatis*
C) *Escherichia coli*
D) *Trichomonas vaginalis*
E) *Ureaplasma urealyticum*

Correct Answer: B.

Epididymitis presents with fever, dysuria, urethral discharge, and tenderness, erythema, and fullness of a testis. Men between the second to fourth decade of life are most commonly affected. The most frequently causative organism is *Chlamydia trachomatis*, followed by *Neisseria gonorrhoeae*. Characteristic clinical features of epididymitis include preservation of the cremasteric reflex (in contrast to its absence in the setting of testicular torsion), a positive Prehn sign, in which testicular pain is alleviated by elevation of the testis, and intact flow on color Doppler ultrasonography. Appropriate diagnostic testing includes Doppler ultrasonography to exclude the presence of torsion, nucleic acid amplification testing to identify causative organisms, such as *C. trachomatis* or *N. gonorrhoeae*, and screening for concomitant sexually transmitted infections, such as syphilis or HIV. Most patients experience resolution of symptoms with antibiotics, including azithromycin and penicillin, and symptomatic relief with nonsteroidal anti-inflammatory drugs, rest, scrotal support, and ice. Men over age 35 years or those who have unprotected anal insertional intercourse are more commonly infected by *E. coli* as opposed to *C. trachomatis* or *N. gonorrhoeae*.

Incorrect Answers: A, C, D, and E.

Candida albicans (Choice A) is a fungal pathogen that causes a variety of infections, including vulvovaginitis, urethritis, thrush, and sepsis. It is rarely implicated as a cause of epididymitis.

Escherichia coli (Choice C) is a common cause of epididymitis in older men as a result of urinary tract obstruction in the setting of benign prostatic hyperplasia. In younger men, sexually transmitted infections with *C. trachomatis* or *N. gonorrhoeae* are more common causes.

Trichomonas vaginalis (Choice D) causes the sexually transmitted infection trichomoniasis, which presents with vaginitis and cervicitis in women and urethritis in men. It is not a common cause of epididymitis.

Ureaplasma urealyticum (Choice E) is a bacterium related to the *Mycoplasma* genus that characteristically lacks a cell wall and that causes urethritis and vaginitis. It is not a common cause of epididymitis.

Educational Objective: Epididymitis presents with fever, dysuria, urethral discharge, and tenderness, erythema, and fullness of a testis, most frequently as a result of infection with *C. trachomatis* or *N. gonorrhoeae*. Characteristic clinical features of epididymitis include preservation of the cremasteric reflex, a positive Prehn sign, and intact flow on color Doppler ultrasonography.

50. A 47-year-old man has had marked shortness of breath during ambulation and at rest for 24 hours. He has no chest pain. He completed a required course of chemotherapy including doxorubicin for non-Hodgkin lymphoma 4 months ago. His resting pulse has increased from 80/min to 110/min during this period. Echocardiography shows a left ventricular ejection fraction of 40%. An ECG shows sinus tachycardia but is otherwise normal. Which of the following is the most likely explanation for these findings?

A) Congestive heart failure
B) Endocarditis
C) Pericarditis
D) Pneumonia
E) Pulmonary embolus

Correct Answer: A.

The most likely cause in this case is anthracycline-induced dilated cardiomyopathy secondary to doxorubicin exposure. Doxorubicin (and other anthracyclines) have a well-established cardiotoxicity adverse effect. Myocyte damage occurs as a result of the increased production of toxic reactive oxygen species that increases oxidative stress leading to lipid peroxidation of myocyte membranes and myocyte apoptosis. Anthracycline-induced dilated cardiomyopathy confers a poor prognosis. Patients managed with doxorubicin should be monitored for cardiotoxicity with routine echocardiography. Patients may develop decompensated congestive heart failure, commonly presenting with dyspnea on exertion, pulmonary crackles (rales), tachycardia, tachypnea, and peripheral edema on physical examination. Echocardiography typically shows dilated heart chambers and a decreased ejection fraction.

Incorrect Answers: B, C, D, and E.

Endocarditis (Choice B) refers to inflammation of the endocardium, which may feature valve dysfunction or vegetations visible on echocardiography. With a known exposure to doxorubicin, anthracycline-induced cardiomyopathy is more likely.

Pericarditis (Choice C) classically presents with substernal chest pain, which is often pleuritic, worse when lying down, and improves with leaning forward. It can occur secondary to inflammatory, infectious, or malignant conditions. ECG findings include widespread ST-segment elevations and PR depressions.

Pneumonia (Choice D) commonly presents with cough, shortness of breath, pleuritic chest pain, fever, and abnormal breath sounds. It often follows an upper respiratory infection or aspiration of oropharyngeal microbes and is more common in immunocompromised persons.

Pulmonary embolus (Choice E) presents with acute chest pain, shortness of breath, and hypoxia, often in a patient with a deep venous thrombosis or a known hypercoagulable state. Small pulmonary emboli are often undetectable on chest x-ray, and the ECG may be normal or show sinus tachycardia. Physical examination typically has no abnormalities. Echocardiography may be normal or show evidence of right heart strain.

Educational Objective: Cardiotoxicity leading to dilated cardiomyopathy is a well-known adverse effect of doxorubicin chemotherapy. This occurs secondary to an increased level of reactive oxygen species and subsequent lipid peroxidation of myocyte membranes.

1. **Patient Information**
Age: 68 years
Gender: M, self-identified
Ethnicity: African American, self-identified
Site of Care: office

History
Reason for Visit/Chief Concern: routine follow-up visit for hypertension and type 2 diabetes mellitus

History of Present Illness:
• patient has felt well
• 15-year history of hypertension
• 15-year history of type 2 diabetes mellitus
Past Medical History:
• otherwise unremarkable
Medications:
• valsartan
• metformin
• atorvastatin
Vaccinations:
• up-to-date except for pneumococcal, which he has never received
Allergies:
• no known drug allergies
Psychosocial History:
• does not smoke cigarettes, drink alcoholic beverages, or use illicit drugs

Physical Examination

Temp	Pulse	Resp	BP	O_2 Sat	Ht	Wt	BMI
37.0°C (98.6°F)	82/min	14/min	136/82 mm Hg	98% on RA	178 cm (5 ft 10 in)	69 kg (153 lb)	22 kg/m²

• Pulmonary: clear to auscultation
• Cardiac: normal S_1 and S_2; no murmurs, rubs, or gallops

Question: Which of the following is the most appropriate management regarding pneumococcal 23-valent polysaccharide vaccine (PPSV23) and pneumococcal 13-valent conjugate vaccine (PCV13) administration?

A) PCV13 vaccination today, followed by PPSV23 vaccination in 1 year
B) PCV13 vaccination today, with no further pneumococcal vaccination indicated
C) PPSV23 vaccination today, followed by PCV13 vaccination in 1 year
D) PPSV23 vaccination today, with no further pneumococcal vaccination indicated
E) No pneumococcal vaccination is indicated

Correct Answer: A.

The Centers for Disease Control and Prevention Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination for protection against pneumococcal disease for infants, children, and adults 65 years of age or older. Pneumococcal species are responsible for a large burden of morbidity and mortality, and large-scale vaccination programs have been effective in reducing the burden of disease. Adults over the age of 65 years who do not have an immunocompromising condition, cerebrospinal fluid leak, or cochlear implant should receive one dose of the pneumococcal 23-valent polysaccharide vaccine (PPSV23). Patients with one of those conditions or who desire the pneumococcal 13-valent conjugate vaccine (PCV13) as well should receive the PCV13 vaccine first followed by the PPSV23 vaccine 1 year later. Any patients who received the PPSV23 vaccine prior to turning 65 years old should receive a single additional dose after the age of 65 years and at least 5 years after the prior dose. It is recommended that this patient receive the PPSV23 vaccination and can be counseled on receiving the PCV13 vaccination as well. If it is decided to administer both vaccines, the patient should receive the PCV13 vaccination today, followed by PPSV23 vaccination in 1 year.

Incorrect Answers: B, C, D, and E.

PCV13 vaccination today, with no further pneumococcal vaccination indicated (Choice B) and no pneumococcal vaccination is indicated (Choice E) are incorrect. Adults over the age of 65 years gain the greatest protective benefit from the PPSV23 vaccination.

PPSV23 vaccination today, followed by PCV13 vaccination in 1 year (Choice C) is incorrect. If both vaccinations are to be administered, the PCV13 vaccination should be performed first as this results in an improved immune response to the pneumococcal serotypes common to both vaccines.

PPSV23 vaccination today, with no further pneumococcal vaccination indicated (Choice D) is reasonable but the patient should be counseled on whether they would like to receive the PCV13 vaccination as well. If both vaccines are to be given, the PCV13 vaccination should be performed first.

Educational Objective: Routine vaccination for protection against pneumococcal disease is recommended for infants, children, and adults 65 years of age or older. The PCV13 and PPSV23 vaccinations given in series confer strong protection for infants, children, and adults with immunocompromising and other at-risk conditions. Administering the PCV13 vaccine prior to PPSV23 demonstrates an improved immune response to the pneumococcal serotypes shared by both vaccines compared to giving them in the opposite order.

2. A 2-year-old girl is brought to the physician for an examination prior to entering day care. The patient has a history of stridor and expiratory wheezing after drinking cow milk. Examination shows no abnormalities. Which of the following is the most appropriate recommendation?

A) Administer prednisone therapy every other day prior to entering day care
B) Avoid day-care placement
C) Introduce gradually increasing amounts of cow's milk to the patient's diet prior to entering day care
D) Provide the day-care center with autoinjectable epinephrine
E) Provide the day-care center with over-the-counter antihistamines

Correct Answer: D.

Food allergies are common in childhood and potentially life-threatening allergic and anaphylactic reactions can occur. Providing the day-care center with autoinjectable epinephrine can help reduce the risk of a fatal reaction. School, day care, and camp environments contain additional risks for pediatric patients with food allergies as patients and their families do not have direct control over potential food exposures. Safety is increased by having facility nurses and staff trained to recognize and respond to allergic reactions, autoinjectable epinephrine available and accessible, and protocols for contacting local emergency services.

Incorrect Answers: A, B, C, and E.

Administer prednisone therapy every other day prior to entering day care (Choice A) is not recommended to prevent a potential allergic reaction from occurring. Care to avoid exposure to the allergen and ready access to autoinjectable epinephrine is the most appropriate recommendation.

Avoid day-care placement (Choice B) is not necessary. Most facilities are aware and have protocols in place to maintain the safety of food-allergic individuals.

Introduce gradually increasing amounts of cow's milk to the patient's diet prior to entering day care (Choice C) with the goal of desensitization, also known as exposure therapy or oral immunotherapy, is not recommended at this time. Current standard of care is avoidance of the allergen and treatment of reactions with autoinjectable epinephrine. There are no approved products for exposure therapy with cow milk allergy.

Provide the day-care center with over-the-counter antihistamines (Choice E) can help in the event of an allergic reaction, but epinephrine and contacting local emergency services take priority. A young patient who develops respiratory and upper airway symptoms during a reaction may not be able to swallow pills.

Educational Objective: The standard of care for food allergies is avoidance of the allergen and treatment of anaphylactic and airway-compromising reactions with autoinjectable epinephrine. Families and adults responsible for the child’s well-being should ensure that appropriate medications are available.

3. A 72-year-old man is admitted to the hospital 40 minutes after the onset of presyncope, fatigue, and malaise. He has myelodysplastic syndrome, IgA deficiency, and hypertension. His medications are lisinopril and hydrochlorothiazide. He appears tired but is not in acute distress. His temperature is 37.7°C (99.9°F), pulse is 80/min, respirations are 14/min, and blood pressure is 120/70 mm Hg. Cardiopulmonary examination shows no abnormalities. His hemoglobin concentration is 6 g/dL. Transfusion of packed red blood cells is begun. Five minutes later, he has moderate abdominal pain, nausea, and nonproductive cough. His temperature is 38.2°C (100.7°F), pulse is 124/min and regular, respirations are 28/min, and blood pressure is 80/50 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. Examination shows no jugular venous distention. Diffuse wheezes are heard bilaterally. Cardiac examination shows no abnormalities. Urinary catheterization yields clear urine. The transfusion is discontinued. Which of the following is the most appropriate immediate step in pharmacotherapy?

A) Diphenhydramine
B) Epinephrine
C) Folic acid
D) Furosemide
E) Immune globulin
F) Levofloxacin

Correct Answer: B.

Epinephrine is the most appropriate medication to administer to this patient with symptoms concerning for an anaphylactic transfusion reaction. Transfusion reactions are common and can range in severity from mild discomfort (eg, itching, fever, mild rash) to life-threatening illness (eg, hemolysis, anaphylaxis). Patients with IgA deficiency are at risk of anaphylaxis secondary to the intrinsic production of anti-IgA antibodies, although this is more common in patients who have undetectable concentrations of IgA. Packed red blood cells, whole blood, platelets, and fresh frozen plasma among several other blood products contain IgA, thus transfusion of any of these products can potentially lead to anaphylaxis. When anaphylaxis is suspected the transfusion should be halted immediately, and the patient should be treated and resuscitated accordingly. Clinical features include laryngeal edema with wheezing or stridor, hypotension, and tachycardia. Epinephrine is the treatment of choice for the treatment of anaphylaxis and is typically administered intramuscularly. Other transfusion reactions that are life-threatening include hemolytic transfusion reactions from ABO incompatibility, but these typically present with abdominal or flank pain and dark urine secondary to hemolysis.

Incorrect Answers: A, C, D, E, and F.

Diphenhydramine (Choice A) is a first-generation antihistamine medication that can be utilized for the treatment of seasonal allergies and insomnia. It carries no mortality benefit in treating anaphylaxis though may be used as an adjunct.

Folic acid (Choice C) is indicated as prophylaxis for gravid patients and for the treatment of patients with severe malnutrition or Wernicke encephalopathy. It would not be helpful in this patient's scenario.

Furosemide (Choice D) is a diuretic and would be an appropriate therapy if this patient had evidence of transfusion associated cardiac overload.

Immune globulin (Choice E) can also cause anaphylaxis in patients with IgA deficiency and would not be beneficial for this patient.

Levofloxacin (Choice F) is a fluoroquinolone antibiotic that is used to treat a variety of infections. While this patient's hypotension, fever, and abdominal pain may represent a transfusion related infection, anaphylaxis should be ruled out first and treated accordingly. Additionally, infections are more commonly acquired from platelet transfusions rather than erythrocyte transfusions.

Educational Objective: Patients with absolute IgA deficiency are at a higher risk of anaphylaxis from the transfusion of blood products as a result of pre-formed antibodies against IgA. Anaphylaxis presents clinically with hypotension, nausea, vomiting, abdominal pain, and respiratory distress. It should be treated promptly with cessation of the transfusion and intramuscular epinephrine.

4. A 22-year-old woman, gravida 1, para 1, comes to the office in February for a follow-up examination 6 weeks after spontaneous vaginal delivery of a healthy male newborn at term. Pregnancy and delivery were uncomplicated. She says she has been tearful during the past 3 weeks and has not left the house since visiting relatives 2 weeks ago. She says she loves her son and husband, but she has not enjoyed spending time with them during the past 2 weeks. She wakes up every 3 hours at night to breast-feed her infant and is unable to sleep well even when her husband offers to care for their son. She spends most of the day in bed with her infant in a crib nearby; she gets up only to feed and change him. She has no history of serious illness, takes no medications, and has no known allergies. Physical examination shows no abnormalities. On mental status examination, she has a depressed mood and flat affect. She does not have suicidal or homicidal ideation. She has not had audio or visual hallucinations. Which of the following is the most likely diagnosis?

A) Bipolar disorder
B) Major depressive disorder
C) Postpartum psychosis
D) Seasonal affective disorder
E) Normal postpartum course

Correct Answer: B.

Symptoms of major depressive disorder include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). To meet major depressive disorder diagnostic criteria, these symptoms must cause decreased daily functioning. This patient demonstrates depressed mood, anhedonia (decreased enjoyment of socializing), and insomnia along with decreased social functioning (not spending time with her husband or baby outside of tending to her baby's basic needs), making an major depressive disorder diagnosis likely. Risk factors for major depressive disorder, postpartum onset include childcare stress, sleep disturbance, decreased estrogen concentration, breast-feeding difficulty, body image dissatisfaction, and poor postpartum social support. Consequences of major depressive disorder, postpartum onset can be severe and include impaired bonding with the child, developmental delays in the child, child neglect, suicide, and infanticide. The relative prevalence and severe consequences of major depressive disorder, postpartum onset necessitate proactive screening in primary care settings. Treatment of major depressive disorder, postpartum onset typically includes psychotherapy or antidepressant medication. Inpatient hospitalization is recommended in severe cases and cases associated with psychotic symptoms, suicidal ideation, or homicidal ideation.

Incorrect Answers: A, C, D, and E.

Bipolar disorder (Choice A) is a mood disorder characterized by acute episodes of hypomania or mania and may include episodes of depression. Acute mania typically manifests with an irritable or euphoric mood, increased energy, a decreased need for sleep, and increased goal-directed activity. Though this patient is sleeping less than usual, she does not demonstrate increased energy or goal-directed activity indicative of a decreased need for sleep. Her depressed mood and decreased level of activity are more consistent with major depressive disorder.

Postpartum psychosis (Choice C) refers to the postpartum onset of psychotic symptoms such as delusions, hallucinations, and/or disorganized thinking or behavior. This patient illustrates a linear thought process devoid of disorganization or delusions when answering the physician's questions about her symptoms and denies hallucinations.

Seasonal affective disorder (Choice D) refers to recurrent mood episodes (eg, depression, mania) during the fall or winter. This patient has no history of previous mood episodes.

A normal postpartum course (Choice E) may include an episode of postpartum blues, a transient state of sadness, crying, irritability, or anxiety that may be related to hormonal changes and resolves within 2 weeks of delivery. This patient is presenting 6 weeks after delivery and appears to meet major depressive disorder criteria, signifying she is not undergoing a normal postpartum course.

Educational Objective: Symptoms of major depressive disorder include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance).

5. A 16-year-old girl is brought to the office by her mother as a new patient because of weight loss. The mother states that 9 months ago, her daughter became preoccupied with her weight; she then began restricting what she ate and exercising vigorously for several hours daily. The mother adds that her daughter's performance at school has deteriorated and that she has withdrawn from her friends. According to the mother, the patient had been an excellent student and an obedient daughter, and she has had no behavioral problems until now. The patient's height is 160 cm (5 ft 3 in); her weight has decreased from 52 kg (114 lb) to 38 kg (84 lb), and her menses have ceased. Current BMI is 15 kg/m^2. The patient is soft-spoken and emotionally bland. She expresses little concern about her severe weight loss and malnourished status. She states that she continues to be dissatisfied with her weight and that she would like to lose additional pounds. Temperature is 36.1°C (97.0°F), pulse is 46/min, and blood pressure is 100/60 mm Hg. Physical examination shows lanugo over the face and body. ECG is ordered. Results of serum laboratory studies are shown:

ALT	110 U/L
AST	121 U/L
Na^+	130 mEq/L
K^+	3 mEq/L
Cl^-	93 mEq/L
HCO_3^-	34 mEq/L
Protein	
Albumin	2.4 g/dL

This patient and her family should be counseled that she is at increased risk for developing which of the following?

A) Atrophic gastritis
B) Osteoporosis
C) Periodontal disease
D) Steatohepatitis
E) Thrombocytopenia

Correct Answer: B.

Anorexia nervosa is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and consequent restrictive eating or binging and purging behavior (eg, vomiting, laxative, or diuretic misuse). Patients with anorexia nervosa often possess a BMI less than 17 kg/m^2 and are malnourished. Anorexia nervosa leads to complications in several organ systems. Vital sign abnormalities commonly include bradycardia (caused by increased vagal tone), hypotension (caused by volume depletion), and hypothermia (caused by malnutrition and loss of insulatory fat). As a result of insufficient nutrition and weight loss, the hypothalamus decreases gonadotropin-releasing hormone secretion, which commonly leads to amenorrhea and hypoestrogenemia. Hypoestrogenemia commonly results in osteoporosis. Poor nutrition leads to electrolyte imbalances and consequent cardiac arrhythmias and seizures in severe cases. The physical examination can disclose dry skin and fine hair or hair loss (related to decreased protein stores) along with lanugo (a compensatory mechanism to conserve heat in hypothermia). Treatment of anorexia nervosa requires a combined medical and psychiatric approach and involves correcting fluid and electrolyte derangements along with behavioral and pharmacologic therapy.

Incorrect Answers: A, C, D, and E.

Atrophic gastritis (Choice A) refers to degenerative gastric mucosal injury by immune phenomena (eg, antiparietal cell antibodies) or *Helicobacter pylori* infection. It is not associated with anorexia nervosa.

Periodontal disease (Choice C) is common in patients with anorexia nervosa and bulimia nervosa who purge via vomiting, as hydrochloric acid from the stomach causes the erosion of tooth enamel. However, this patient demonstrates restricting, not purging behavior.

Steatohepatitis (Choice D), referring to the accumulation of fat in the liver leading to inflammation, may occur in refeeding syndrome. However, starvation in anorexia nervosa more commonly leads to liver atrophy.

Thrombocytopenia (Choice E) may occur rarely in severe cases of anorexia nervosa. Starvation can lead to hypoplastic bone marrow and consequent anemia, leukopenia, and, rarely, thrombocytopenia. However, osteoporosis is much more common in patients with anorexia nervosa.

Educational Objective: Anorexia nervosa is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and consequent restrictive eating or binging and purging behavior. A relatively common complication of anorexia nervosa is osteoporosis. Malnutrition commonly suppresses the hypothalamic release of gonadotropin-releasing hormone, resulting in hypoestrogenemia and consequent osteoporosis.

6. A 9-year-old girl is brought to the physician by her mother because of behavioral problems at school during the past 6 months. Her teachers report that she refuses to speak or answer questions in front of the class yet answers questions when the teacher approaches her one-on-one. Her mother reports that her daughter will not answer the telephone at home and will not tell waiters what she wants in restaurants. On questioning, the patient states that she worries throughout the school day that others think she is "stupid." Her mother reports that her daughter interacts normally with her family. Physical examination shows no abnormalities. The patient is quiet and avoids direct eye contact. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Generalized anxiety disorder
C) Oppositional defiant disorder
D) Social phobia
E) Specific phobia
F) Normal behavior

Correct Answer: D.

Social phobia, also known as social anxiety disorder, refers to an excessive fear of scrutiny, embarrassment, or rejection in social and/or performance situations, leading to significant distress and/or impaired functioning. Patients with social anxiety disorder commonly exhibit shyness (avoidance of socializing) and performance anxiety. Performance anxiety refers to the fear of negative evaluation in situations such as public speaking (eg, answering questions in class) and test-taking. Patients with social anxiety disorder may experience decreased anxiety when interacting in more intimate settings or with familiar people compared to socializing in groups or with strangers. Treatment typically involves cognitive-behavioral therapy and antidepressant medication (eg, selective serotonin reuptake inhibitors) and may also include as-needed anxiolytic medication.

Incorrect Answers: A, B, C, E, and F.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient does not possess a history of a recent trauma or demonstrate intrusive thoughts or memories.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features excessive worrying about a range of topics with associated functional impairment for longer than 6 months. This patient's anxiety is specific to social situations.

Oppositional defiant disorder (Choice C) manifests as a persistent pattern of angry mood, defiant behavior, and vindictiveness that causes distress and impaired functioning in the child or their caretakers. This patient's disobedience is specific to anxiety-inducing social situations, and she does not endorse an angry mood.

Specific phobia (Choice E) is a psychiatric disorder featuring anxiety about a certain situation or object (eg, heights, animals, blood) that causes significant distress or social/occupational impairment. Social anxiety disorder is a more precise diagnosis characterized by anxiety specific to social situations.

Normal behavior (Choice F) may include mild degrees of social anxiety, especially in public speaking situations. However, this patient's excessive worrying and refusal to speak across multiple social situations is more consistent with social anxiety disorder.

Educational Objective: Social anxiety disorder refers to an excessive fear of scrutiny or embarrassment in social and/or performance situations that commonly leads to avoidance behavior. Treatment typically involves cognitive-behavioral therapy and antidepressant medication.

7. A 47-year-old man is disoriented and having auditory hallucinations 2 days after open reduction and internal fixation of a femoral fracture sustained in a motor vehicle collision. He received perioperative cefazolin, and today his only medication is morphine for pain control. On admission, his blood alcohol concentration was 120 mg/dL. He has a 25-year history of alcoholism. He has smoked two packs of cigarettes daily for 30 years. His temperature is 38°C (100.4°F), pulse is 120/min, respirations are 26/min, and blood pressure is 175/95 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. Cardiac and abdominal examinations show no abnormalities. Examination of the incision site shows no evidence of infection. On mental status examination, he says that he hears voices. Laboratory studies show a hematocrit of 44% and leukocyte count of 11,000/mm^3. An x-ray of the chest shows no abnormalities. Further laboratory studies are most likely to show which of the following electrolyte abnormalities?

A) Hyperglycemia
B) Hyperkalemia
C) Hypocalcemia
D) Hypomagnesemia
E) Hyponatremia

Correct Answer: D.

Delirium tremens, the most concerning and life-threatening complication of alcohol withdrawal, involves severe confusion and disorientation, fluctuations in consciousness, agitation, visual or auditory hallucinations, and autonomic instability (fluctuations in heart rate and blood pressure with hyperthermia). Delirium tremens typically begins between 48 hours and 1 week after the patient's last drink. Delirium tremens is managed with benzodiazepines (eg, lorazepam) to address agitation and prevent the symptoms of withdrawal, along with fluids, nutritional supplementation of deficient vitamins and minerals, and frequent assessment including vital sign checks. The vitamins that are commonly deficient in patients with alcohol use disorder include thiamine, folate, vitamin B_{12}, vitamin A, and vitamin B_6, while commonly deficient minerals include magnesium, iron, and zinc. The pathogenesis of hypomagnesemia is likely related to decreased oral intake and alcohol-induced urinary excretion of magnesium.

Incorrect Answers: A, B, C, and E.

Hyperglycemia (Choice A) would be atypical. Alcohol use disorder can lead to hypoglycemia and alcoholic ketoacidosis caused by malnutrition and alcohol's effects on glucose metabolism.

Hyperkalemia (Choice B) would be atypical. Some patients with alcohol use disorder demonstrate hypokalemia, which is partly related to abnormal urinary excretion of potassium secondary to hypomagnesemia. Low oral intake of potassium-containing foods is also common in alcohol use disorder.

Hypocalcemia (Choice C) is relatively common in patients with alcohol use disorder but is less common than hypomagnesemia and may represent a downstream consequence of hypomagnesemia (via impairment of renal tubular absorption of calcium and increased parathyroid hormone secretion).

Hyponatremia (Choice E) is relatively common in patients with alcohol use disorder, potentially representing a consequence of hypovolemia. However, hypomagnesemia is more common.

Educational Objective: Delirium tremens is a life-threatening complication of alcohol withdrawal that presents with confusion, agitation, visual hallucinations, and autonomic instability. Patients with alcohol use disorder commonly demonstrate deficiencies of vitamins and minerals including magnesium.

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8. A 67-year-old man comes to the physician because of a 2-month history of progressive loss of peripheral vision. He has type 2 diabetes mellitus treated with metformin. He appears to be in mild discomfort. His temperature is 37°C (98.6°F), pulse is 84/min and regular, and blood pressure is 160/98 mm Hg. Ocular movements are intact bilaterally. The pupils are equal, round, and reactive to light. Funduscopic examination shows increased optic cupping bilaterally. Cardiopulmonary examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) Carotid duplex ultrasonography
B) Fluorescein angiography
C) Gonioscopy
D) MRI of the brain and neck
E) Tonometry

Correct Answer: E.

Primary open angle glaucoma is a chronic, progressive optic neuropathy that results in loss of retinal ganglion cell axons and loss of peripheral vision, most commonly as a result of increased intraocular pressure. The retinal ganglion cell axons course from across the retina to collect at the optic disc, where they form a physiologic cup as they course into the optic nerve. The loss of these axons results in a thinning of the nerve rim at the edges of the optic disc and appears as an enlargement of the optic disc cup. Primary open angle glaucoma presents with the insidious loss of peripheral vision, and therefore most patients are entirely asymptomatic until the disease is severely advanced. Tonometry, the measuring of the intraocular pressure, is the most important step in the examination of patients who are suspected of having glaucoma, as increased intraocular pressure is the most important risk factor for glaucomatous damage. All of the currently existing treatments for glaucoma, such as topical eye drops, laser trabeculoplasty, or surgical filtering or shunting procedures, are directed at decreasing the intraocular pressure in order to slow or halt the rate of glaucomatous optic nerve damage.

Incorrect Answers: A, B, C, and D.

Carotid duplex ultrasonography (Choice A) is useful for evaluation of causes of unilateral vision loss, such as ocular ischemic syndrome or central retinal artery occlusion. This patient's history of insidious, bilateral peripheral vision loss is more suggestive of glaucoma.

Fluorescein angiography (Choice B) is useful for evaluation of the perfusion of the retina and the integrity of retinal vasculature and may identify areas of non-perfusion secondary to retinal arterial or venous obstruction or as a result of diabetic retinopathy. It has little role in the evaluation of glaucoma.

Gonioscopy (Choice C) is a technique used to visualize the anterior chamber angle and is a crucial step in the evaluation of glaucoma, as it allows for distinguishing between open and closed angle forms of glaucoma. The structures of the anterior chamber undergo total internal reflection at the tear film-air interface. During gonioscopy, the examiner applies a mirror lens directly to the corneal surface to overcome total internal reflection and view structures within the angle. While gonioscopy is an essential step in the evaluation of glaucoma, tonometry is performed prior to gonioscopy, as compression of the cornea with a gonioscopic lens may alter the intraocular pressure.

MRI of the brain and neck (Choice D) is useful for the detection of causes of increased intracranial pressure, such as brain tumors. While increased intracranial pressure may present with the slow loss of vision, the optic nerve typically manifests papilledema, rather than cupping.

Educational Objective: Primary open angle glaucoma is a chronic, progressive optic neuropathy that results in loss of retinal ganglion cell axons and loss of peripheral vision, most commonly as a result of increased intraocular pressure. Tonometry, the measuring of the intraocular pressure, is the most important step in the examination of patients who are suspected of having glaucoma, as increased intraocular pressure is the most important risk factor for glaucomatous damage.

9. A 20-year-old man comes to the physician because of a 3-day history of a rapidly progressive rash over his extremities and trunk. Initially, he noticed nontender, flat, reddish brown lesions, but now the lesions have formed into blisters and he has burning pain. He has a 7-year history of epilepsy; 10 days ago, he was switched from phenobarbital to carbamazepine therapy after having breakthrough seizures. He has no other history of serious illness and no known allergies. On arrival, he is in distress. His temperature is 37.4°C (99.3°F), pulse is 100/min, respirations are 18/min, and blood pressure is 110/74 mm Hg. Examination shows confluent erythema over the face, trunk, and extremities. A photograph of the skin lesions is shown. The remainder of the examination shows no abnormalities. In addition to discontinuing carbamazepine, which of the following is the most appropriate next step in management?

A) Antistaphylococcal antibiotic therapy
B) Antiviral therapy
C) Corticosteroid therapy
D) Hyperbaric oxygen therapy
E) Intensive support and wound management in a burn unit

Correct Answer: E.

Intensive support and wound management in a burn unit is the next appropriate step in the management of this patient with Stevens-Johnson syndrome. Stevens-Johnson syndrome (SJS) is a severe cutaneous drug reaction that can easily progress to toxic epidermal necrolysis (TEN) with an accompanying high mortality rate. SJS and TEN are distinguished from each other on the basis of body surface area involvement only (<10% for SJS and >30% for TEN) but are driven by the same underlying pathophysiology. Common culprits of drug eruptions include β-lactam antibiotics, anti-epileptics, sulfa-containing medications including trimethoprim-sulfamethoxazole, nonsteroidal anti-inflammatory drugs, and allopurinol. It is characterized by confluent areas of dusky erythema with desquamation of the epidermis, as shown in this image. It can be distinguished from a morbilliform, or maculopapular, drug eruption by the presence of skin pain, desquamation, and mucosal involvement. SJS and TEN are often complicated by infection of the denuded areas of skin, thus meticulous wound care, preferably in a burn unit, is critical. Unlike the management of burn patients, however, debridement or any accidental removal of sloughing epidermis must be avoided as this greatly increases the risk of infection. The offending agent should be identified and stopped. The role of systemic corticosteroids, intravenous immunoglobulin, and other systemic therapies is controversial; these have not been shown to significantly improve mortality.

Incorrect Answers: A, B, C, and D.

Antistaphylococcal antibiotic therapy (Choice A) is not indicated in the management of SJS or TEN unless there is a secondary staphylococcal infection that needs to be treated. However, staphylococcal scalded skin syndrome (SSSS), which is treated with antibiotics, is in the differential diagnosis of desquamating erythema. SSSS is more common in children and less likely in a patient with a medication history supporting a diagnosis of SJS/TEN.

Antiviral therapy (Choice B) is not necessary in the treatment of SJS or TEN as neither condition has a viral cause.

Systemic corticosteroid therapy (Choice C) has not been shown to improve mortality in SJS/TEN and in fact may worsen mortality. Topical corticosteroid therapy may be useful in areas of erythema that have not yet desquamated, but wound management is more important. Application of a topical medication to areas of desquamation should be performed with great caution so as not to propagate the desquamation and lead to larger areas of involvement.

Hyperbaric oxygen therapy (Choice D) does not have a clear role in the management of SJS/TEN patients.

Educational Objective: SJS and TEN are severe cutaneous drug reactions with high mortality rates. Common drug culprits include β-lactam antibiotics, anti-epileptics, sulfa-containing medications including trimethoprim-sulfamethoxazole, non-steroidal anti-inflammatory drugs, and allopurinol. Treatment includes supportive care and wound management, preferably in an intensive care unit qualified to treat burns.

10. An 82-year-old woman with hypertension comes to the physician because of a 9-month history of moderate pain in her hips and knees. She has an active lifestyle and lives independently with her husband. Her medications are hydrochlorothiazide, metoprolol, and a calcium supplement. Her blood pressure is 128/84 mm Hg. Examination shows mild limitation on external rotation of both hips. On standing, the patient has pain in the right knee that she rates as an 8 on a 10-point scale. Laboratory studies show:

Hemoglobin	12.6 g/dL
Hematocrit	39%
Leukocyte count	7800/mm^3
Serum	
Na^+	140 mEq/L
K^+	3.9 mEq/L
Cl^-	110 mEq/L
HCO_3^-	26 mEq/L
Urea nitrogen	12 mg/dL
Creatinine	1 mg/dL

The patient asks if she can take an over-the-counter nonsteroidal anti-inflammatory drug (NSAID) for her arthritis. If treatment with an NSAID is begun, this patient is at greatest risk for which of the following adverse effects?

A) Altered mental status
B) Impaired renal function
C) Renal papillary necrosis
D) Thrombocytopenia
E) There is no increased risk for adverse effects

Correct Answer: B.

If treatment with nonsteroidal anti-inflammatory drugs (NSAIDs) was initiated in this patient, she would be at risk of impaired renal function. Nonsteroidal anti-inflammatory drugs, such as ibuprofen and naproxen, are a common cause of nephrotoxicity. Nonsteroidal anti-inflammatory drugs are non-selective cyclooxygenase (COX) inhibitors and reduce pain and inflammation by decreasing the production of inflammatory cytokines and prostaglandins. Within the glomerulus, prostaglandins physiologically induce afferent arteriolar vasodilation and thereby increase glomerular perfusion. Because of this, nonsteroidal anti-inflammatory drug use at high doses or over a prolonged period of time can lead to decreased glomerular perfusion and acute kidney injury (AKI). AKI sustained in this manner is especially likely if high-risk nonsteroidal anti-inflammatory drug use is accompanied by renal blood flow-limiting insults such as volume depletion (eg, diarrhea, vomiting, dehydration) or heart failure. Nonsteroidal anti-inflammatory drugs can also cause intrinsic kidney injury through acute interstitial nephritis (AIN). AIN is characterized by declining urine output and glomerular filtration rate, rising creatinine, eosinophilic infiltrates on kidney biopsy, and eosinophiluria. It is often associated with a rash, and is triggered by medications including nonsteroidal anti-inflammatory drugs, diuretics, and antibiotics.

Incorrect Answers: A, C, D, and E.

Altered mental status (Choice A) is a less frequent adverse effect of nonsteroidal anti-inflammatory drugs that is seen primarily when indomethacin is used in the geriatric population. This patient is at a higher risk of kidney injury than altered mental status from NSAID use.

Renal papillary necrosis (RPN) (Choice C) describes the sloughing and loss of the renal papillae following ischemic, inflammatory, infectious, or toxin-mediated damage. RPN can be triggered by infections (eg, acute pyelonephritis), diabetes mellitus, sickle cell disease, or nonsteroidal anti-inflammatory drugs. However, it is an uncommon occurrence, thus the patient's risk of generally impaired kidney function is higher than that of renal papillary necrosis.

Thrombocytopenia (Choice D) is not a commonly seen adverse effect of nonsteroidal anti-inflammatory drugs. Nonsteroidal anti-inflammatory drugs diminish platelet function by inhibiting COX-1 from producing thromboxane-A_2 and indirectly amplifying the platelet response, but the total number of platelets circulating in the blood is typically unchanged.

The patient is at risk of developing impaired kidney function with the chronic use of nonsteroidal anti-inflammatory drugs for osteoarthritis, so there is some risk of an adverse effect (Choice E) and she should be counseled appropriately.

Educational Objective: Nonsteroidal anti-inflammatory drugs decrease the production of prostaglandins by inhibiting cyclooxygenase. High doses or prolonged use of these drugs may cause decreased glomerular perfusion by reducing afferent arteriolar vasodilation, leading to acute or chronic kidney damage. Nonsteroidal anti-inflammatory drugs should be used with caution, especially in the geriatric population and in patients with additional underlying risk factors for kidney injury.

11. A 62-year-old man comes to the emergency department because of a 35-minute history of severe chest pain. He has had mild intermittent chest pain with exertion during the past 3 weeks. The pain has typically lasted a few minutes and resolved either with rest or spontaneously. He has not had nausea or dyspnea. He has hypertension treated with hydrochlorothiazide and enalapril and type 2 diabetes mellitus treated with insulin glargine. His temperature is 37.1°C (98.9°F), pulse is 90/min, respirations are 12/min, and blood pressure is 140/86 mm Hg. Physical findings are otherwise normal. An ECG and chest x-ray show no abnormalities. Which of the following is the most appropriate initial step in management?

A) Outpatient exercise stress test
B) CT scan of the chest
C) Proton pump inhibitor therapy
D) Ibuprofen therapy
E) Admission to the hospital for observation

Correct Answer: E.

Exertional chest pain accompanied by shortness of breath that improves with rest is suggestive of stable angina pectoris, caused by cardiac ischemia from insufficient perfusion during exertion through narrowed coronary arteries. This patient presents with worsening symptoms of angina, occurring more frequently and for a longer duration of time. This is consistent with unstable angina, defined by angina symptoms that are new, occur at rest or are worsening in severity. Unstable angina is a type of acute coronary syndrome, which requires admission to the hospital and urgent diagnostic testing, including serial ECGs, troponin testing, cardiology consultation, and a stress test or cardiac catheterization. Patients with unstable angina are stratified based upon the Thrombolysis in Myocardial Infarction (TIMI) score, which assists in identifying the need for therapeutic anticoagulation and coronary angiography.

Incorrect Answers: A, B, C, and D.

An outpatient exercise stress test (Choice A) would be inappropriate for a patient with a history concerning for unstable angina. Exercise stress test may be indicated, but first, the patient must be urgently admitted to the hospital for further diagnostic testing and management of unstable angina and acute coronary syndrome. Once further diagnostic tests are completed, the patient's risk can be further delineated using the TIMI score to determine the next most appropriate step in management, which may include stress testing and/or coronary angiography.

CT scan of the chest (Choice B) is not an appropriate diagnostic test for acute coronary syndrome or unstable angina. CT scan of the chest can evaluate for pulmonary embolism, aortic dissection, pneumothorax, pneumonia, and other structural causes of chest pain.

Proton pump inhibitor therapy (Choice C) is a treatment of choice for gastritis, peptic ulcer disease, and upper gastrointestinal bleeding. This patient's chest pain is more likely to the result of a cardiac cause and less likely to the result of a gastrointestinal cause.

Ibuprofen (Choice D) is a nonsteroidal anti-inflammatory drug that can be used for relief of mild-to-moderate pain and fever. However, it would be inappropriate and unhelpful in the treatment of unstable angina.

Educational Objective: Unstable angina is one type of acute coronary syndrome and is typified by new onset chest pain or worsening anginal symptoms. Patients with unstable angina require admission to the hospital and urgent diagnostic testing, including serial ECGs, troponin testing, cardiology consultation, and a stress test or cardiac catheterization.

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12. A 38-year-old man comes to the physician because of a 3-week history of increasing pressure in his chest and shortness of breath with exertion. He has no history of serious illness and takes no medications. He has smoked one-half pack of cigarettes daily for 20 years and consumes four mixed alcoholic drinks weekly. His pulse is 65/min, and blood pressure is 155/90 mm Hg. Examination shows a brisk carotid upstroke. On cardiac examination, there is a grade 4/6 systolic murmur heard best along the left sternal border at the fourth intercostal space. The murmur increases on Valsalva maneuver and with standing. An ECG shows left ventricular hypertrophy. Which of the following is the most appropriate pharmacotherapy?

A) Digoxin
B) Furosemide
C) Lisinopril
D) Metoprolol
E) Nitroglycerin

Correct Answer: D.

This younger, otherwise healthy patient with a murmur exacerbated in states of low preload and an ECG demonstrating left ventricular hypertrophy likely has hypertrophic obstructive cardiomyopathy (HOCM), otherwise known as idiopathic hypertrophic subaortic stenosis. This condition, which is suspected to have autosomal dominant inheritance, results in hypertrophy of myocytes leading to a focal obstruction in the left ventricular outflow tract (LVOT). It classically presents with syncope or sudden cardiac death in an otherwise healthy, young athlete. As a result of the narrowed LVOT, any hemodynamic influence that prevents the stenting open of the tract (eg, low preload leading to low stroke volume as a result of Valsalva maneuver, standing, or hypovolemia) will result in an exacerbation of the murmur caused by an increased turbulent blood flow. Significant derangements in hemodynamics can cause complete obstruction of the LVOT, commonly causing obstruction by abnormal motion of the mitral valve. Resultant reduction in cardiac output leads to syncope. Arrhythmogenic foci are also a common cause of mortality. Treatment focuses on prevention of symptoms and complications, and commonly includes the use of β-adrenergic blockers (eg, metoprolol, as in this case) which slow the pulse and reduce the likelihood of ectopic beats, antiarrhythmics, placement of implantable cardioverter-defibrillators, and surgical procedures such as mitral clipping and myomectomy.

Incorrect Answers: A, B, C, and E.

Digoxin (Choice A), an atrioventricular nodal blocker and inotrope, is not generally used in the treatment of HOCM outside of the presence of concomitant heart failure with a reduced ejection fraction.

Furosemide (Choice B), a diuretic, may be used in cases of HOCM and concomitant heart failure, however it may lower preload and exacerbate symptoms so must be used with the consideration of risks and benefits. Nitroglycerin (Choice E), a venodilator, also results in preload reduction and is similarly relatively contraindicated.

Lisinopril (Choice C), an ACE inhibitor and afterload reducer, may also be used in cases of HOCM with concomitant hypertension, heart failure, or diabetes mellitus, however, may result in systolic collapse of the LVOT and exacerbation of obstruction. Its use is thus controversial and must be based on risk-benefit analysis with frequent reassessment.

Educational Objective: HOCM results in hypertrophy of myocytes leading to a focal obstruction in the left ventricular outflow tract. It classically presents with syncope or sudden cardiac death, and is treated with β-adrenergic blockers, placement of implantable cardioverter-defibrillators, or cardiac surgery.

13. A 67-year-old man comes to the physician for a follow-up examination. Three days ago, he went to the emergency department because of a prolonged nosebleed that was not related to any injuries; after undergoing nasal packing for 4 hours, he was discharged and advised to schedule a follow-up examination with his primary care physician. During the past 3 years, he has had two similar nosebleeds, one of which required cauterization. He has had two episodes of upper gastrointestinal bleeding during the past 10 years. He has psoriasis and osteoarthritis. Current medications include acetaminophen and topical betamethasone cream. He avoids use of aspirin and aspirin-containing medications. He has smoked one pack of cigarettes daily for 45 years. He drinks one alcoholic beverage daily. He does not use illicit drugs. His temperature is 37°C (98.6°F), pulse is 72/min, respirations are 16/min, and blood pressure is 130/76 mm Hg. Jugular venous pressure is 7 cm H_2O. A photograph of the lips and tongue is shown. The lungs are clear to auscultation. There are no murmurs or gallops. The abdomen is soft and nontender with no hepatosplenomegaly. There is no peripheral edema. Laboratory studies from 3 days ago show:

Hematocrit	34%
Platelet count	285,000/mm^3
Prothrombin time	11.6 sec (INR =1.05)
Serum creatinine	1.1 mg/dL

Which of the following is the most likely diagnosis?

A) Cirrhosis with portal hypertension
B) Hereditary hemorrhagic telangiectasia
C) Mallory-Weiss syndrome
D) Peutz-Jeghers syndrome
E) von Willebrand disease

Correct Answer: B.

Hereditary hemorrhagic telangiectasia (HHT) is the most likely diagnosis. HHT is characterized by the formation of multiple telangiectasias and arteriovenous malformations (AVM) throughout the body. Telangiectasias often form on mucosal surfaces (as seen on this patient's tongue) such as the mouth, lips, nasal mucosa, and gastrointestinal tract. When such lesions rupture, patients may experience epistaxis (a common presenting complaint in HHT), or gastrointestinal bleeding. Larger and often more complex AVMs are known to occur in the central nervous system, lungs, and solid organs. AVMs may present with multiple symptoms depending on their location including cyanosis or strokes (if causing a pulmonary shunt) or signs of liver failure such as hyperammonemia (if resulting in bypass of the liver). A ruptured AVM can cause catastrophic, life-threatening bleeding, especially if located in the brain or spinal cord. HHT is transmitted by autosomal dominant-pattern genetics, thus, should be suspected with a family history of telangiectasias and recurrent bleeding. Diagnosis is based on the Curacao criteria, which include the presence of recurrent bleeding, the presence of telangiectasias in typical locations, a demonstrated visceral AVM, and the presence of a first-degree relative with HHT. Laboratory studies will show normal platelet counts, bleeding times, and coagulation times, as there is no underlying hematologic abnormality. Treatment includes avoidance of blood thinning and antiplatelet agents, supportive care for minor bleeding, iron supplementation if anemia results, and surgical management of larger, complicated, or ruptured AVMs.

Incorrect Answers: A, C, D, and E.

Cirrhosis with portal hypertension (Choice A) presents with signs and symptoms including the presence of ascites, edema, and jaundice. Portal hypertension results in dilation of submucosal veins in many gastrointestinal locations, including the distal esophagus (leading to life threatening variceal bleeding), stomach, and rectal venous plexus. Caput medusae, palmar erythema, and gynecomastia may also be seen.

Mallory-Weiss syndrome (Choice C) is characterized by hematemesis that results from retching leading to tears in the esophageal mucosa. It is a transient condition that resolves following resolution of the inciting retching. Patients generally present with blood-streaked vomitus.

Peutz-Jeghers syndrome (Choice D) is a hereditary condition that results in hamartomatous polyps forming in the gastrointestinal tract, accompanied by pigmented macules about the lips. Gastrointestinal lesions may bleed, however epistaxis or bleeding of oral lesions is not characteristic.

Von Willebrand disease (Choice E) is a common heritable cause of mucosal bleeding and bruising as a result of a deficiency in platelet adhesion. Telangiectasias are not a common feature.

Educational Objective: HHT is characterized by the formation of multiple telangiectasias and AVMs, which may bleed, rupture, or cause organ dysfunction depending on their location. Management is supportive for mild bleeding, and surgery may be required for large or complex lesions.

14. A 34-year-old man is brought to the emergency department 30 minutes after he was involved in a motor vehicle collision in which he was the restrained driver. He drove off the road and hit a tree. The air bags did not deploy. On arrival, he appears to be in distress. He has no history of serious illness and takes no medications. Temperature is 35.0°C (95.0°F), pulse is 100/min, respirations are 20/min, and blood pressure is 80/40 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Examination shows a 2-cm laceration over the right aspect of the forehead and ecchymoses over the face, torso, and all extremities. There is jugular venous distention. Heart sounds are distant. No other abnormalities are noted. Which of the following is the most appropriate next step to confirm the diagnosis?

A) Arterial blood gas analysis
B) Complete blood count
C) CT scan of the chest
D) CT scan of the head
E) ECG
F) Echocardiography
G) X-ray of the chest

Correct Answer: F.

Chest trauma followed by hypotension, muffled or distant heart sounds, and jugular venous distention (Beck triad) is suggestive of cardiac tamponade. Cardiac tamponade is characterized by rapid accumulation of blood or fluid in the pericardial space that prevents diastolic filling of the cardiac chambers, leading to low cardiac output caused by low stroke volume. The speed of accumulation is important in the pathophysiology of tamponade – gradual accumulation (eg, in states of malignancy or tuberculosis) permits stretching and expansion of the parietal pericardium without necessarily impairing chamber expansion. In cases of hemodynamic instability when the pretest probability of the condition is high, the pericardial space should be decompressed without delay. This is accomplished via pericardiocentesis, in which a large needle or angiocatheter is inserted into the pericardial space via a subxiphoid or parasternal approach to evacuate the fluid or blood and permit chamber expansion. Echocardiography permits visualization of the heart and its chambers, and in cases of tamponade, will show a pericardial effusion of variable size, with right ventricular collapse during diastole. In general, the patient in this case may receive bedside emergency echocardiography while preparing for pericardiocentesis, but imaging should not delay intervention in any unstable patient (as in this case).

Incorrect Answers: A, B, C, D, E, and G.

Arterial blood gas analysis (Choice A) may be useful in determining the cause of hypoxia, in monitoring or adjusting ventilator settings, or in analyzing or developing a differential diagnosis around a patient's acid-base physiology. It is not appropriate to use in diagnosing cardiac tamponade.

Complete blood count (Choice B) may be used to assess leukocytosis or leukopenia in cases of infection, inflammation, or malignancy, anemia (though in acute trauma, hemodilution will not have yet occurred, and the hemoglobin and hematocrit will likely be at baseline), or thrombocytosis or thrombocytopenia. It has no role in diagnosing tamponade, nor does it have a significant role in diagnosing acute traumatic anemia.

CT scan of the chest (Choice C) would disclose the presence of a pericardial effusion but is time-consuming and would permit an excessive period of time of hemodynamic instability in the case of unstable tamponade.

CT scan of the head (Choice D) is appropriate in this case of high-energy head trauma, however, does not take priority over diagnosing or managing cardiac tamponade given the patient's hemodynamic instability.

ECG (Choice E) is appropriate in diagnosing cardiac dysrhythmias and heart blocks, hypertrophy, electrolyte derangements, toxic disturbances, and ischemia, among other diagnoses. Electrical alternans may be seen in cases of large effusions, however this finding is non-specific for tamponade.

X-ray of the chest (Choice G) may be useful in diagnosing traumatic fractures, pulmonary contusions, pneumothoraces, great vessel injury, or bowel rupture; in cases of tamponade, it may show irregular contour of the cardiac borders, but is nonspecific.

Educational Objective: Pericardial effusions are best diagnosed with echocardiography. In any case of hemodynamic instability suspected to arise from an effusion leading to tamponade, treatment should not be delayed in favor of an imaging diagnosis.

15. A 3-year-old girl is brought to the office by her mother because of a 1-month history of moderate leg pain when she runs more than 20 yards. The pain does not occur at rest or when she walks. She was born at term following an uncomplicated pregnancy and spontaneous vaginal delivery. She has no history of serious illness and receives no medications. Immunizations are up-to-date. She is at the 40th percentile for height and 50th percentile for weight. Her pulse is 110/min, and blood pressure is 130/85 mm Hg in both upper extremities. No murmurs are heard on cardiac examination. An epigastric bruit is heard. Pulses are 3+ in the upper extremities and 2+ in the lower extremities. Muscle strength is 5/5 in all extremities. No other abnormalities are noted. Which of the following is the most likely diagnosis?

- A) Coarctation of the aorta
- B) Congenital heart disease
- C) Hypoplasia of the iliac arteries
- D) Liddle syndrome
- E) Mesenteric artery stenosis

Correct Answer: A.

Coarctation of the aorta describes an area of focal narrowing of the vessel, often at or around the aortic arch or proximal branch arteries, especially near the site of the ductus arteriosus, though it can occur anywhere in its course. It is often a congenital condition diagnosed in infancy or childhood. The narrowing of the aorta results in increased resistance to flow as a result of the decreased cross-sectional diameter (Poiseuille law). Consequentially, pressures in the vessel proximal to the coarctation will be increased, and those distal to it will be decreased. Similarly, there will be a differential in blood flow proximal and distal to the narrowing. Characteristic presenting features include exercise intolerance caused by failure to supply exercising lower extremity musculature with increased blood flow, atrophic lower extremities, diminished pulses in the lower extremities, a differential in blood pressure when measured between the four extremities, a systolic murmur in the area of the coarctation (in this case, an epigastric bruit), and left ventricular hypertrophy on ECG. The coarctation may be seen on CT or MR angiography or on conventional arteriography; it may also be suspected on arterial Doppler analysis. Echocardiography may sometimes disclose the diagnosis. Treatment is generally surgical in cases of symptomatic or significant coarctation.

Incorrect Answers: B, C, D, and E.

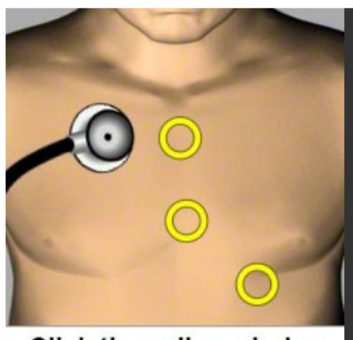
Congenital heart disease (Choice B) may describe tetralogy of Fallot, transposition of the great vessels, truncus arteriosus, tricuspid atresia, total anomalous pulmonary venous return, or other malformations. In general, congenital heart disease is diagnosed at birth or in infancy caused by cyanosis, fatigue with feeding, a persistent or unusual murmur, or edema.

Hypoplasia of the iliac arteries (Choice C) is a possible explanation in this case, as such hypoplasia may present with exertional claudication, a pulse deficit, and a blood pressure differential. However, an epigastric bruit would be inconsistent with iliac artery hypoplasia.

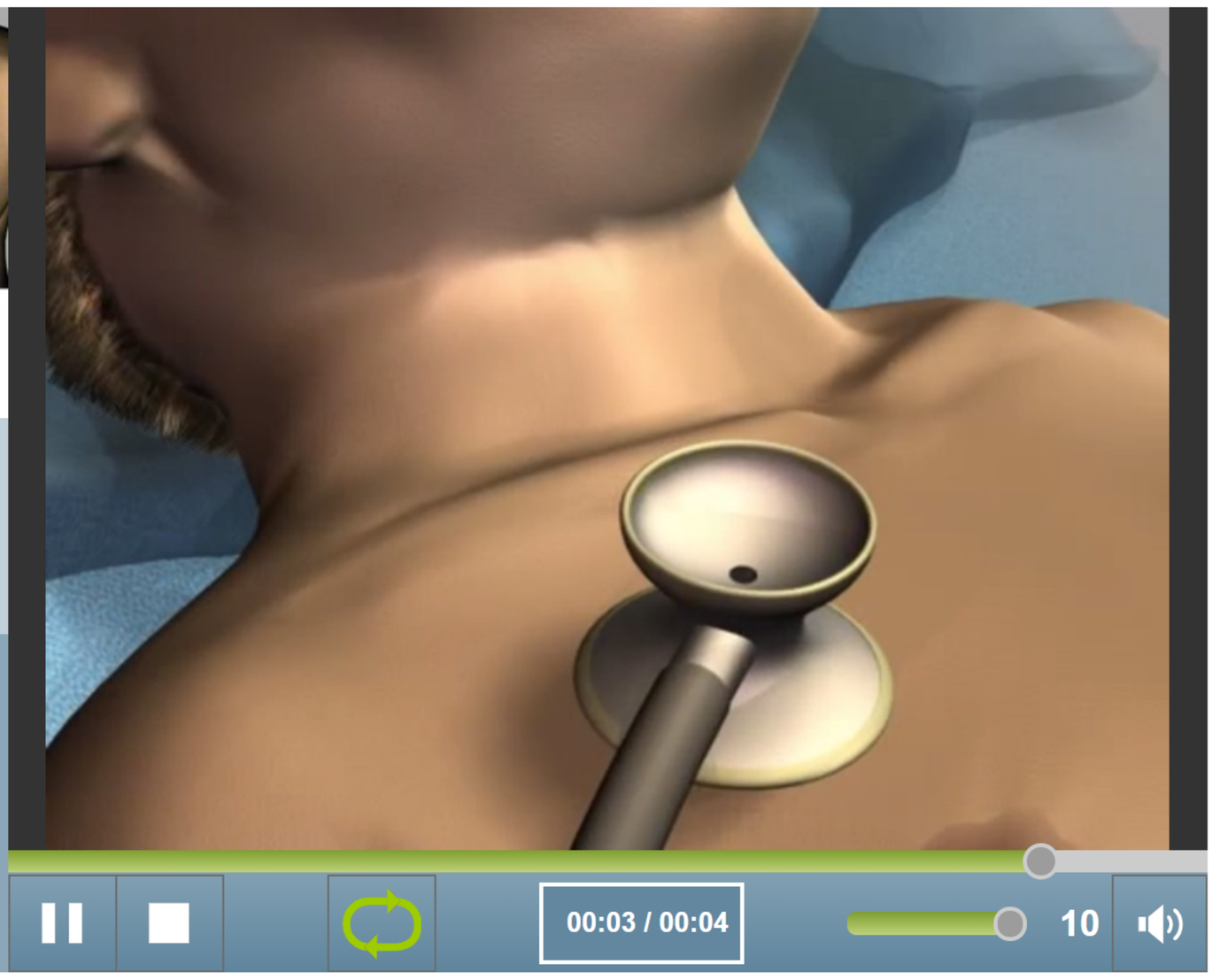
Liddle syndrome (Choice D) arises as a result of nephron channelopathy leading to increased activity of the epithelial sodium channels. It presents with hypertension, fluid retention, and hypochloremic metabolic alkalosis. A pulse deficit or bruit would not be characteristic.

Mesenteric artery stenosis (Choice E) presents with abdominal pain following the consumption of food; a pulse deficit, blood pressure differential, and exertional claudication would not be associated.

Educational Objective: Coarctation of the aorta (a narrowing of the vessel) presents with a pulse and blood pressure differential, exertional claudication, a murmur or bruit, and may result in hypertrophy of proximal structures (eg, left ventricle) and atrophy of distal structures. Treatment is generally surgical.



Click the yellow circles on the chest diagram to move the stethoscope.



16. A previously healthy 4-year-old boy is brought to the physician because of a 3-day history of fever, cough, and runny nose. He has not had wheezing, vomiting, or diarrhea. He is at the 75th percentile for height and 10th percentile for weight. His temperature is 37.5°C (99.5°F). The skin is warm and pink. Capillary refill time is 2 seconds. Examination shows clear rhinorrhea. Breath sounds are normal. Cardiac examination is shown. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Congestive heart failure
B) Idiopathic pulmonary hypertension
C) Pericarditis
D) Upper respiratory tract infection
E) Ventricular septal defect

Correct Answer: D.

Many children will experience multiple benign, viral upper respiratory tract infections each year in infancy and childhood. Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Systemic symptoms such as chills, myalgias, arthralgias, and fatigue may occur as with any viral syndrome. The patient in this example presents with signs of a viral upper respiratory tract infection without any evidence of significant or serious bacterial infection (eg, pneumonia). Treatment includes supportive care, as most cases are self-limited and without complication, though parents should observe for persistent fevers, productive cough, or ear pain or discharge, as these may be signs of progression to pneumonia or acute otitis media. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation; these can be distinguished from pulmonary or cardiac sounds by listening with one earpiece of the stethoscope, permitting one-sided chest auscultation and correlation with external, ambient breath sounds from the patient in the non-auscultating ear.

Incorrect Answers: A, B, C, and E.

Congestive heart failure (Choice A) is uncommon in children apart from in cases of congenital heart disease. It generally presents with cough and shortness of breath (when left-sided) and with edema, hepatomegaly, or jugular venous distention (JVD) (when right-sided). Murmurs may be present on auscultation.

Idiopathic pulmonary hypertension (Choice B) generally presents with shortness of breath, chest discomfort on exertion, and signs of right-sided heart failure (eg, edema, hepatomegaly, JVD). Pulmonic or tricuspid murmurs may be heard, especially a loud P_2, and tricuspid regurgitation.

Pericarditis (Choice C) presents with central chest discomfort that often follows a viral infection. Pain is generally worse when supine and improved when upright; a friction rub is classically heard on auscultation.

Ventricular septal defect (Choice E) presents with a holosystolic murmur located at the midsternal area on the left. They are often asymptomatic and incidentally present in an estimated 1 to 2% of newborns, often spontaneously closing over the first years of life.

Educational Objective: Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation. These should be distinguished from rhonchi, rales, wheezes, and murmurs, friction rubs or gallops.

17. A 23-year-old woman comes to the physician because of a 3-year history of an intermittent cough productive of copious amounts of yellow-green sputum. She has been taking oral antibiotics; an inhaled, short-acting β-adrenergic agonist; and an inhaled, long-acting corticosteroid for the past 12 months. The episodes of cough and sputum production recur every 4 to 6 weeks and last 3 to 5 days. She had severe pneumonia at the age of 13 years that required hospitalization and placement of a chest tube. She has no other history of serious illness. She has never smoked cigarettes. She is not in acute distress. Vital signs are within normal limits. Examination shows no clubbing. Occasional end-expiratory wheezes are heard posteriorly; there are no crackles or rhonchi. The remainder of the examination shows no abnormalities. A chest x-ray shows bronchial thickening. Which of the following is the most likely diagnosis?

A) Adult-onset asthma
B) Allergic bronchopulmonary aspergillosis
C) Bronchiectasis
D) Kartagener syndrome
E) Löffler syndrome
F) Sarcoidosis

Correct Answer: C.

Bronchiectasis refers to irreversible, abnormal dilatation and thickening of the bronchi that results from recurrent necrotizing infections and chronic inflammation. Patients typically present with frequent cough, excessive sputum production, and frequent respiratory exacerbations. Narrow and obstructed airways result in wheezing on pulmonary auscultation. They often have a history of recurrent episodes of pneumonia in childhood and adolescence. Conditions associated with bronchiectasis include chronic bronchial obstruction, tobacco use, cystic fibrosis, primary immunodeficiency disorders, Kartagener syndrome (primary ciliary dyskinesia), and allergic bronchopulmonary aspergillosis. CT scan of the chest is used to confirm the diagnosis. Management consists of identification and treatment of the underlying disorder, airway clearance techniques (including chest physiotherapy, expectorants, and bronchodilators), and antibiotics for acute exacerbations.

Incorrect Answers: A, B, D, E, and F.

Adult-onset asthma (Choice A) is characterized by reversible obstruction to airflow caused by the spasm of smooth muscle in the bronchi and small airways, and may present with dyspnea, wheezing, or chronic nonproductive cough. It is often triggered by an allergen (eg, smoke, pollen), exercise, or temperature change. Bronchial thickening on chest x-ray and childhood episodes of pneumonia are more typical for bronchiectasis.

Allergic bronchopulmonary aspergillosis (Choice B) is a hypersensitivity reaction to a pulmonary infection with fungal *Aspergillus* species characterized by asthma, eosinophilia, and bronchiectasis. Patients typically have low-grade fevers and hemoptysis. Diagnosis can be made using clinical presentation, the presence of transient pulmonary infiltrates on imaging, and a demonstrable immune response to *Aspergillus* antigen exposure.

Kartagener syndrome (Choice D) is an inherited disorder of ciliary function that most commonly presents in early childhood. Patients typically present with situs inversus, impaired mucociliary clearance with recurrent pneumonia and bronchiectasis, chronic sinusitis, and infertility disorders. The patient would require further testing to determine if Kartagener syndrome is another possible underlying cause as well as for cystic fibrosis.

Löffler syndrome (Choice E) is a type of eosinophilic pulmonary disease characterized by peripheral eosinophilia, transient respiratory symptoms, nonproductive cough, and migratory pulmonary opacities. It is associated with parasitic infections and is more prevalent in tropical latitudes.

Sarcoidosis (Choice F) is a non-caseating granulomatous disease that often involves the lung, and classically presents with shortness of breath and cough. It tends to affect younger patients, females more than males, and patients with African American ethnicity. Characteristic imaging findings include bilateral hilar lymphadenopathy, with or without bilateral upper lobe predominant interstitial infiltrates.

Educational Objective: Bronchiectasis refers to irreversible dilatation and thickening of the bronchi that results from recurrent necrotizing infections and chronic inflammation. It is associated with conditions that result in impaired mucociliary clearance and immune dysfunction.

18. A 68-year-old man comes to the office because of a 1-year history of a dry cough and progressive dyspnea on exertion. He has type 2 diabetes mellitus and hypertension. Medications are metformin, atorvastatin, losartan, hydrochlorothiazide, and daily aspirin. The patient smoked one pack of cigarettes daily for 50 years but quit 6 months ago. He says that since that time, his symptoms have been rapidly worsening. He does not drink alcoholic beverages. He is a retired power plant worker for a local electric company. He is 170 cm (5 ft 7 in) tall and weighs 87 kg (193 lb); BMI is 30 kg/m^2. Temperature is 37.1°C (98.8°F), pulse is 80/min, respirations are 24/min, and blood pressure is 147/80 mm Hg. Auscultation of the lungs discloses fine, dry inspiratory crackles at the bases and no friction rub. Cardiac examination discloses an increased S_2 with a right ventricular lift. CT scan of the chest shows 1- to 2-cm bilateral subpleural densities. Which of the following is the most likely diagnosis?

A) Asbestosis
B) Berylliosis
C) Emphysema
D) Sarcoidosis
E) Tuberculosis

Correct Answer: A.

Asbestosis is a type of pneumoconiosis that results from inhalation of asbestos fibers leading to progressive inflammation and fibrosis of the alveoli and pulmonary interstitium. Patients may be asymptomatic, or develop chronic pulmonary disease characterized by a chronic cough and dyspnea associated with progressive pulmonary fibrosis. Occupational exposure is the greatest risk factor for developing disease. Occupations with notable risk for asbestos exposure include plumbers, pipefitters, steamfitters, electricians, insulation workers, carpenters, general laborers, boilermakers, welders, cutters, and janitors. Physical examination may disclose pulmonary crackles, digital clubbing, and signs of pulmonary hypertension and right ventricular hypertrophy such as a parasternal heave, loud P_2, and widely split S_2. Characteristic imaging findings may include bilateral infiltrates with a lower lung predominance, calcified pleural plaques, and rounded atelectasis. Pleural effusions may be present.

Incorrect Answers: B, C, D, and E.

Berylliosis (Choice B) exposure is more common in aerospace and nuclear engineering and presents as a noncaseating granulomatous disease with lymphadenopathy that resembles sarcoidosis (Choice D). The history of working as an electrician and the presence of subpleural lesions are more suggestive of asbestosis.

Emphysema (Choice C) describes structural changes to the lung that result in abnormal and enlarged air spaces distal to the terminal bronchioles with loss of individual alveoli that would be noted on chest imaging.

Tuberculosis (Choice E) primary infection presents with subacute fevers, weight loss, night sweats, cough, and malaise. Suspicion would be higher in endemic areas or for patients who have spent significant time in high-risk areas.

Educational Objective: Asbestosis is a chronic progressive pulmonary disorder associated with interstitial fibrosis and an increased risk for both primary bronchogenic carcinoma and malignant mesothelioma. Occupational exposure is the greatest independent risk factor.

19. A 28-year-old man is brought to the emergency department because of a 2-day history of mild abdominal discomfort, fever, and diarrhea. He has had three episodes of similar symptoms during the past 2 years. During two episodes, metronidazole therapy provided mild relief. He has no history of serious illness and currently takes no medications. There is no family history of serious illness. The patient has been sexually active with three male partners during the past 3 years; he uses condoms inconsistently. None of his partners has HIV infection. Results of the patient's HIV antibody test were negative 7 months ago. He works as a waiter and often eats leftover restaurant food. His temperature is 38°C (100.4°F). His blood pressure is 125/80 mm Hg when supine and 110/70 mm Hg when standing. Examination shows dry mucous membranes. The abdomen is mildly distended; on palpation, there is diffuse tenderness and boggy fullness of the right lower quadrant. Bowel sounds are increased. Rectal examination shows multiple perianal fissures. Laboratory studies show a hematocrit of 40%, a leukocyte count of 17,000/mm^3, and an erythrocyte sedimentation rate of 49 mm/h. Results of liver function tests are within the reference ranges. Test of the stool is negative for ova and parasites and positive for leukocytes; culture grows no bacteria. An abdominal x-ray shows an enlarged ileocecal mass and a narrow cecal lumen. Which of the following is the most appropriate next step in management?

A) Colonoscopy
B) Esophagogastroduodenoscopy
C) Metronidazole therapy
D) MRI of the abdomen
E) Ultrasonography of the abdomen

Correct Answer: A.

Crohn disease is characterized by transmural inflammation of the gastrointestinal tract, most frequently involving the terminal ileum. It can arise anywhere in the gastrointestinal tract and is a subclass of inflammatory bowel disease. Most patients experience chronic abdominal cramping, bloody diarrhea, anemia, and weight loss. Examination often demonstrates generalized abdominal tenderness, sometimes worse in the right lower quadrant, and, depending on the severity and extent, may show complications such as enterocutaneous fistulas, perianal fissures, abscesses, and extraintestinal manifestations such as uveitis. Severe Crohn disease can result in intestinal obstruction from stricture or inflammation, bowel perforation, intraabdominal abscess, and the formation of additional fistulas. Diagnosis occurs through colonoscopy with biopsy, which is the best next step in the management of this patient. Laboratory studies often show increased erythrocyte sedimentation rate, C-reactive protein, and positive fecal leukocytes. Treatment is with anti-inflammatory medications, immunomodulators, and glucocorticoids. Complicated, severe cases sometimes require surgery including bowel resection or colectomy.

Incorrect Answers: B, C, D, and E.

Esophagogastroduodenoscopy (Choice B) is not likely to disclose the diagnosis in this patient with a presentation consistent with inflammatory bowel disease and an ileocecal mass that requires direct visualization and biopsy. Patients with upper gastrointestinal symptoms such as reflux, early satiety, nausea, and emesis may benefit from upper endoscopic evaluation.

Metronidazole therapy (Choice C) is a mainstay of antibiotic therapy for anaerobic bacterial infection and is frequently included in empiric regimens for suspected intra-abdominal and gastrointestinal infections. The patient's presentation, imaging findings, and prior minimal response to metronidazole courses are more consistent with Crohn disease.

MRI of the abdomen (Choice D) can be useful for establishing the extent of disease once the diagnosis has been established. It is particularly effective for evaluating the small bowel, which is not accessible via endoscopy. However, colonoscopy with evaluation of the ileocecal mass and biopsy acquisition should be performed first.

Ultrasonography of the abdomen (Choice E) is especially useful for evaluation of the liver, biliary structures, kidneys, spleen, and abdominal aorta. It would not likely provide useful diagnostic data for this patient at this time.

Educational Objective: Crohn disease classically presents with abdominal pain, fever, and bloody diarrhea. Colonoscopy with biopsy and tissue analysis is the diagnostic study of choice.

20. A 77-year-old man comes to the physician because of a painless mass in front of his right earlobe that he first noticed 3 years ago; it has increased in size during this time. He has not had difficulty chewing or swallowing or changes in his hearing. He has hypertension and type 2 diabetes mellitus. His medications are atenolol, lisinopril, and glipizide. He does not smoke cigarettes or drink alcohol. His temperature is 37°C (98.6°F), pulse is 62/min, respirations are 16/min, and blood pressure is 120/78 mm Hg. Examination shows a 2-cm, firm, irregular, nontender mass at the angle of the right aspect of the mandible. Cranial nerves are intact. There is no cervical lymphadenopathy. Which of the following is the most appropriate next step in management?

A) Serum viral titer
B) Sialography
C) CT scan of the head and neck
D) Cephalexin therapy
E) Fine-needle aspiration biopsy of the mass
F) Surgical excision of the mass

Correct Answer: E.

The best next step in management of this patient is a fine-needle aspiration biopsy of the mass. Masses located in the salivary glands (the parotid gland in this case) may be benign or malignant, with the majority being benign. Masses can include neoplasms (eg, pleomorphic adenoma, Warthin tumor), cysts, and lymphadenopathy, or infiltrative processes. While the majority of salivary gland masses are benign, masses with certain features carry a higher likelihood of malignancy, which must be excluded. Features suggestive of malignancy include a chronic, slowly progressive course, immobility of the mass, irregular shape, and an absence of tenderness. Concomitant ipsilateral facial nerve palsy suggests an invasive lesion, as does lymphadenopathy in the draining nodal chain. By contrast, acutely presenting, painful, mobile lesions, especially when accompanied by other systemic symptoms, suggests a benign, inflammatory, or infectious process. Fine-needle aspiration biopsy is highly sensitive and specific for benign tumors, and moderately so for malignant lesions. It may be followed by excisional biopsy in cases of high suspicion of malignancy.

Incorrect Answers: A, B, C, D, and F.

Serum viral titer (Choice A) may be appropriate in cases where a viral sialadenitis/parotitis is suspected (eg, mumps). Generally, viral processes are bilateral, and are accompanied by systemic signs and symptoms of disease.

Sialography (Choice B) may be useful in cases of suspected sialolithiasis, cystic disease, ductal stricture or stenosis, to assess intraductal tumors, or to assess obstruction to drainage. It is not the best next step when malignancy is a differential diagnosis.

While a CT scan of the head and neck (Choice C) is a reasonable choice to delineate size, extent, and spread of a tumor, it generally does not distinguish between benign and malignant lesions when referencing salivary gland lesions. In practice, imaging may be obtained ahead of biopsy to localize the most favorable lesion for sampling, though it is not a necessary precursor.

Cephalexin therapy (Choice D) may be used in cases of bacterial infection (eg, *Staphylococcus aureus* parotitis) or abscess, however this patient does not present with any symptoms suggestive of infection.

Surgical excision of the mass (Choice F) may be appropriate depending on the character of the mass, especially in cases of localized malignancy. Prior to an invasive procedure that carries significant morbidity and risk (eg, damage to the facial nerve), a less invasive method should be employed to determine surgical necessity. A benign lesion may require no operative intervention.

Educational Objective: Salivary gland masses may be neoplastic, infectious, infiltrative, or cystic. Most salivary neoplasms are benign; however, a biopsy should be conducted to determine the histopathologic character of the lesion, which determines the next appropriate intervention.

21. A 27-year-old woman comes to the physician because of a 5-day history of headache, severe, diffuse abdominal pain, and nausea and vomiting. The pain is exacerbated by eating and relieved by vomiting. The vomitus initially consisted of a large amount of semisolid material mixed with a clear green liquid but now consists of clear yellow liquid only. She has not had any other symptoms. She has Crohn disease treated with prednisone; she was instructed to taper her dosage 2 weeks ago. Additional medications include mesalamine and azathioprine. Her last menstrual period was 7 weeks ago. She is sexually active with one male partner, and they use condoms inconsistently. She appears ill and is in moderate distress. Her temperature is 38.4°C (101.2°F), pulse is 120/min, respirations are 22/min, and blood pressure is 90/50 mm Hg. Examination shows dry oral mucosa and pale conjunctivae. The abdomen is distended, diffusely tender, and tympanitic. Bowel sounds are decreased. Pelvic examination shows no abnormalities. Laboratory studies show:

Hematocrit	31%
Leukocyte count	15,000/mm^3
Serum	
Amylase	300 U/L
Lipase	9 U/L (N=14–280)

Which of the following is the most likely diagnosis?

A) Acute pancreatitis
B) Gastric outlet obstruction
C) Gastroparesis
D) Migraine
E) Pelvic inflammatory disease
F) Pregnancy
G) Small-bowel obstruction
H) Viral gastroenteritis

Correct Answer: G.

The most likely diagnosis given the history of Crohn disease, vomiting, and a diffusely tender, distended, tympanitic abdomen is a small bowel obstruction (SBO). SBO occurs as a result of a physical limitation in the transit of contents of the bowel. The most common causes of SBO are post-surgical peritoneal adhesions, strictures, and hernias, though lymphadenopathy and masses, volvuli, and inflammation (eg, Crohn disease) are all known causes. In this case, the patient's Crohn disease likely predisposed her to obstruction, either through primary transmural inflammation narrowing the bowel lumen, or through the development of stricture, adhesion, or abscess. Symptoms of SBO include crampy abdominal pain, bloating, constipation, nausea, vomiting that may be bilious or feculent, and obstipation; vomiting is generally exacerbated by oral intake. In this case, what began as semisolid material transitioned to clear liquid once the proximal contents of the tract had been evacuated. Physical examination findings include abdominal distention, tympany, and hyperactive bowel sounds. Generally, unless dehydration, perforation, or an infectious or inflammatory process is present, vital signs will be stable. This patient's fever and tachycardia plus hypotension suggest a complication such as a Crohn flare, peritonitis, intraabdominal abscess, or perforation. Diagnosis is through the history plus imaging (eg, CT scan) which will show distended loops of proximal small bowel, with a transition point at the point of obstruction. Treatment includes fluid resuscitation, nasogastric decompression, and potentially surgical correction depending on extent, location, and complicating features.

Incorrect Answers: A, B, C, D, E, F, and H.

Acute pancreatitis (Choice A) generally presents with epigastric pain, nausea, and vomiting, often in association with gallstone disease, alcohol use, or trauma. Lipase concentration is a specific indicator and is generally increased.

Gastric outlet obstruction (Choice B) may present similarly to SBO, however, on examination, a gastric succussion splash may be heard on auscultation. Abdominal tenderness would also often be focal over the left upper quadrant, and diffuse distention would be less likely.

Gastroparesis (Choice C) is a functional obstruction related to delayed gastric emptying. It is often seen in cases of diabetes and autonomic neuropathy. It presents with left upper quadrant tenderness, nausea, and vomiting. Diffuse distention, tympany, and tenderness would be atypical.

Migraine (Choice D) is a headache that presents with gradual-onset unilateral or bilateral retroorbital or temporal pain, often accompanied by vomiting, photophobia, and phonophobia. Abdominal migraine may occur, however mechanical signs of obstruction such as distention and tympany would be unlikely.

Pelvic inflammatory disease (Choice E) presents with fever, abdominal and pelvic pain, cervical and vaginal discharge, and cervical motion tenderness. Nausea and vomiting may occur, but distention and tympany suggest SBO given the absence of any vaginal or pelvic focal signs or symptoms.

Pregnancy (Choice F) may be associated with hyperemesis gravidarum, but objective signs of SBO would not be present. Additionally, this patient's last menses was 7 weeks ago, making pregnancy as a cause of abdominal distention unlikely. Pregnancy should be ruled out, however.

Viral gastroenteritis (Choice H) generally presents with self-limited nausea, vomiting, crampy, nonfocal abdominal pain, increased bowel sounds, and diarrhea.

Educational Objective: SBO occurs as a result of a physical limitation in the transit of contents of the small bowel. Common causes include post-surgical adhesions, strictures, Crohn disease, and hernias. Symptoms include crampy abdominal pain, bloating, constipation, nausea, vomiting, and obstipation. Physical examination findings include abdominal distention, tympany, and hyperactive bowel sounds.

22. A 42-year-old man comes to the physician because of a 2-day history of fever and cough productive of thick yellow sputum. He has no history of serious illness and takes no medications. His temperature is 38.9°C (102°F), pulse is 90/min, respirations are 20/min, and blood pressure is 130/70 mm Hg. On pulmonary examination, crackles are heard at the base of the left lung. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hemoglobin	14 g/dL
Mean corpuscular volume	90 μm^3
Leukocyte count	12,000/mm^3
Platelet count	350,000/mm^3
Prothrombin time	12 sec (INR=1)
Red cell distribution width	13% (N=13%–15%)
Serum	
Bilirubin, total	2.1 mg/dL
Indirect	1.7 mg/dL
AST	30 U/L
ALT	30 U/L

Which of the following is the most likely explanation for this patient's laboratory findings?

A) Congenital reduction of glucuronyltransferase
B) Disseminated intravascular coagulation
C) Hepatic vein thrombosis
D) Intravascular hemolysis secondary to pneumonia
E) Obstruction of the bile duct

Correct Answer: A.

Congenital reduction of glucuronyltransferase is the most likely explanation of this patient's increased total and indirect bilirubin concentration, which is consistent with Gilbert syndrome. Glucuronyltransferase is an enzyme that is responsible for the conjugation of bilirubin. Decreased concentration of this enzyme can lead to the accumulation of unconjugated (indirect) bilirubin, especially during acute illnesses. This patient's presentation with fever, cough, leukocytosis, and a pulmonary infiltrate are suggestive of pneumonia. It is common for patients with Gilbert syndrome to experience asymptomatic increases in indirect bilirubin during periods of illness and physiologic stress. Gilbert syndrome is not life-threatening, and the diagnosis can be made clinically; it does not require the measurement of enzyme concentrations. There is no specific treatment for Gilbert syndrome, although this patient should be treated with antibiotics for his pneumonia.

Incorrect Answer: B, C, D, and E.

Disseminated intravascular coagulation (Choice B) is a coagulopathy that occurs as a result of the abnormal consumption of clotting factors and can be precipitated by sepsis or malignancy. Laboratory studies show an increased prothrombin time, increased partial thromboplastin time, decreased platelet count, and decreased fibrinogen concentration.

Hepatic vein thrombosis (Choice C), also known as Budd-Chiari syndrome, has a variable presentation with abdominal pain, increased hepatic enzymes, and occasionally fulminant hepatic failure. Diagnosis is often made by Doppler ultrasonography.

Intravascular hemolysis secondary to pneumonia (Choice D) can sometimes occur with Mycoplasma pneumoniae infection and presents with increased indirect bilirubin concentration, anemia, and reticulocytosis. This patient lacks these features.

Obstruction of the bile duct (Choice E), also called choledocholithiasis, is more likely to present with increased direct (conjugated) bilirubin rather than indirect bilirubin. Additional findings often include right upper quadrant pain and increased concentration of alkaline phosphatase.

Educational Objective: Gilbert syndrome is a benign disorder of abnormal bilirubin conjugation that results from a deficiency of the enzyme glucuronyltransferase. Inadequate conjugation of bilirubin during periods of physiologic stress, as may occur during infection, leads to an increased serum concentration of indirect bilirubin. The diagnosis can be made clinically, and treatment is not necessary.

23. A 65-year-old woman comes to the office because of a 6-month history of moderate upper abdominal pain that radiates to the back and foul-smelling diarrhea. She says the pain is often worse after eating. She also has had occasional nausea and vomiting during this time. She has hypertension and impaired glucose tolerance. Her only medication is lisinopril. She does not smoke cigarettes. She drinks four glasses of wine each evening. Her pulse is 68/min, respirations are 10/min, and blood pressure is 142/87 mm Hg. Abdominal and rectal examinations show no abnormalities. Results of a complete blood count, measurement of serum electrolyte concentrations, measurement of amylase and lipase activities, and liver function tests are within the reference ranges. MR cholangiopancreatography shows calcifications and pancreatic duct obstruction. Which of the following is the most appropriate next step in management?

A) Celiac plexus block
B) Extracorporeal shock wave lithotripsy
C) Omeprazole therapy
D) Pancreatic enzyme supplementation
E) Pancreatic resection

Correct Answer: D.

Pancreatic enzyme supplementation is the most appropriate next step in management of this patient with signs and symptoms consistent with chronic pancreatitis. Chronic pancreatitis is a progressive disease process caused by pancreatic injury from recurrent bouts of acute pancreatitis that results in pancreatic fibrosis, and loss of acinar cells, islet cells, and ducts. In addition to chronic abdominal pain as a result of inflammation, patients may develop pancreatic insufficiency caused by decreased exocrine and endocrine pancreatic secretions. Absence of pancreatic lipase results in steatorrhea and an inability to absorb fat-soluble vitamins including vitamins A, D, E, and K. Patients may also develop diabetes mellitus as a result of decreased pancreatic insulin production. Patients with chronic pancreatitis should be treated with pancreatic enzyme repletion and with supplementation of fat-soluble vitamins.

Incorrect Answers: A, B, C, and E.

Celiac plexus block (Choice A) is a useful modality for the treatment of refractory abdominal pain secondary to either malignant or benign pathologies. While it has been used for patients with chronic pancreatitis, it has not been found to be particularly effective.

Extracorporeal shock wave lithotripsy (Choice B) is a technique typically used to aid in the removal of renal calculi in the renal pelvis or in the ureters. This patient's pancreatic calcifications and duct obstruction are secondary to chronic pancreatitis and she is unlikely to receive any benefit from lithotripsy.

Omeprazole therapy (Choice C) is useful for patients with findings consistent of gastritis or gastroesophageal reflux disease. This patient's presentation is more consistent with chronic pancreatitis.

Pancreatic resection (Choice E) would be considered in cases of pancreatic cancer but would provide no benefit in this patient with chronic pancreatitis.

Educational Objective: Chronic pancreatitis can result in pancreatic insufficiency as a result of chronic, progressive pancreatic inflammation, fibrosis, and loss of acinar cells and islet cells. The decreased secretion of pancreatic digestive enzymes, including lipase, results in steatorrhea and a decreased ability to absorb fat-soluble vitamins. Treatment is with pancreatic enzyme replacement.

24. A 68-year-old man comes to the office because of a 2-day history of blood and clots in his urine. He has not had pain or other difficulties with urination. He thinks he may have lost several pounds during the past 3 months, but he has not weighed himself recently. He has hypertension and chronic bronchitis, exacerbations of which occur once or twice yearly and require antibiotic therapy; his most recent antibiotic course was completed 1 month ago. Routine medications are amlodipine and hydrochlorothiazide. The patient smoked one pack of cigarettes daily for 40 years but quit 15 years ago. He is 173 cm (5 ft 8 in) tall and weighs 66 kg (145 lb); BMI is 22 kg/m^2. Temperature is 37.0°C (98.6°F), pulse is 100/min, and blood pressure is 142/88 mm Hg. Physical examination discloses no abnormalities. CT scan of the abdomen with contrast shows a 2.5-cm enhancing cystic mass lesion with internal necrosis in the mid pole of the left kidney. Chest x-ray shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Biopsy of the kidney mass

B) Initiation of sunitinib therapy

C) Left nephrectomy

D) Repeat CT scan of the abdomen in 3 months

E) Urine cytologic study

Correct Answer: C.

Left nephrectomy is the next most appropriate step in management of this patient with a kidney mass concerning for renal cell carcinoma (RCC). Male patients, and especially those with a smoking history, are at a higher risk for RCC than the general population. Patients may be asymptomatic at the time of diagnosis or may have findings such as hematuria. The imaging characteristics, including the presence or absence of enhancement, the size, and the location of the tumor can all help determine the appropriate method of intervention. The presence of an enhancing mass lesion with central necrosis is concerning for a malignant kidney tumor, and this patient should undergo surgery with curative intent. In the past, many of these patients have been treated with radical nephrectomy, although more recently those patients with tumors less than 2.5 cm in size and no evidence of extra-renal extension have seen similar outcomes with partial nephrectomy, and lower rates of subsequent chronic kidney disease.

Incorrect Answers: A, B, D, and E.

Biopsy of the kidney mass (Choice A) is sometimes considered for small kidney tumors with imaging features that are not entirely consistent with malignancy, but this patient has both imaging and clinical findings consistent with malignancy, and thus should undergo definitive treatment with nephrectomy.

Initiation of sunitinib therapy (Choice B) is inappropriate prior to a confirmed tissue diagnosis.

Repeat CT scan of the abdomen in 3 months (Choice D) is not recommended in this patient who has imaging and clinical findings that are concerning for cancer; this would unnecessarily delay treatment.

Urine cytologic study (Choice E) is low-yield and would not change this patient's management. Even if cytologic study were negative, this patient's presentation is concerning enough to require definitive treatment with surgery.

Educational Objective: RCC can present with hematuria and signs of malignancy such as weight loss and malaise, or it may be asymptomatic and identified incidentally on imaging. Kidney masses are characterized and managed according to size and characteristics such as the presence or absence of enhancement. Lesions with central necrosis, a size larger than 4 to 5 cm, or clinical findings such as hematuria should raise the suspicion for RCC. These patients are often treated with radical or partial nephrectomy.

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25. A 23-year-old primigravid woman at 40 weeks' gestation is admitted to the hospital in labor. The cervix is completely dilated, and the vertex is at −1 station in an occipitoanterior position. One hour later, there is no change in station. Intravenous oxytocin therapy is started. Four hours later, despite good contractions and good pushing, the station remains unchanged. Fetal heart tones remain normal. Which of the following is the most appropriate next step in management?

A) Continuing pushing for 1 hour
B) Intravenous morphine therapy to allow the patient to rest
C) Vacuum extraction
D) Forceps delivery
E) Cesarean delivery

Correct Answer: E.

Labor consists of three defined stages. The first stage is divided into latent and active labor and encompasses the start of labor (contractions and cervical change) until the completion of cervical dilation and effacement. The second stage includes the time from complete cervical dilation to the newborn's birth, and the third stage contains the delivery of the placenta. The first stage of labor is considered latent until the cervix is 4 to 6 cm dilated, after which the rate of cervical dilation increases, and the patient is considered to be in active labor. The active stage of labor can be protracted, which occurs when the cervix dilates at less than 1 to 2 cm per hour, or arrested, in which case there is no cervical change for greater than 4 hours with adequate contractions or no cervical change for greater than 6 hours with inadequate contractions. Protraction and arrest can be caused by hypotonic contractions, cephalopelvic disproportion, and a non-occipitoanterior fetal presentation. Protraction of the active phase of labor can be managed with oxytocin to augment uterine contractions and prostaglandins to assist in cervical ripening, whereas arrest of the active phase of labor is managed with cesarean delivery.

Incorrect Answers: A, B, C, and D.

Continuing pushing for 1 hour (Choice A) is incorrect, as this mother has been adequately pushing for 4 hours without change in the fetal station. Further pushing is likely to lead to maternal exhaustion without further descent of the fetus, as this mother likely has cephalopelvic disproportion that cannot be overcome with pushing.

Intravenous morphine therapy to allow the patient to rest (Choice B) is not commonly recommended in actively laboring patients, as opioids can cross the placenta and cause respiratory depression in the fetus. Additionally, allowing this mother to rest will likely not result in improvement of the fetal station as she has been adequately contracting for 4 hours, making further contractions unlikely to be successful.

Vacuum extraction (Choice C) and forceps delivery (Choice D), or operative vaginal delivery, can be utilized in the setting of maternal exhaustion with inadequate pushing, fetal compromise, or a prolonged second stage of labor. However, in order for operative vaginal delivery to occur, the head must be fully engaged in the pelvis (0 station), and this fetus has not moved past -1 station.

Educational Objective: Arrest of active labor occurs when there is no cervical change for greater than 4 hours with adequate contractions or greater than 6 hours with inadequate contractions. This is often a result of cephalopelvic disproportion or a non-occipitoanterior fetal presentation. If the fetal head is fully engaged in the pelvis, management can include operative vaginal delivery; if it is not, cesarean delivery is recommended.

26. A 37-year-old woman, gravida 5, para 4, at 35 weeks' gestation comes to the physician for a routine prenatal visit. Her pregnancy has been uncomplicated. All of her previous pregnancies ended in cesarean deliveries at term. Physical examination shows a uterus consistent in size with a 35-week gestation. Pelvic ultrasonography at 21 weeks' gestation showed an anterior placenta previa. This patient is at greatest risk for which of the following pregnancy complications?

A) Amniotic fluid embolism
B) Placenta accreta
C) Pulmonary embolism
D) Vasa previa

Correct Answer: B.

Placenta accreta refers to the abnormal attachment of the placenta to the uterine myometrium. This most commonly occurs uterine scarring, which leads to an abnormal interface between the placental villi and the endometrium, leading to abnormally deep placental anchoring into the myometrium. The most significant risk factors for placenta accreta are prior cesarean delivery and the presence of placenta previa. The risk of placenta accreta is drastically increased in women with previa who have had numerous prior cesarean deliveries. Large cohort studies have determined that in the presence of previa the risk of accreta is 3%, 11%, 40%, 61%, and 67% for women with one, two, three, four, and five or more prior Cesarean sections, respectively. Ultrasonography is the best imaging modality for the diagnosis of placenta accreta. Placenta accreta is associated with an increased risk of postpartum hemorrhage which may be life-threatening, and the need for hysterectomy; these risks can be minimized by referring patients to a center experienced in the management of placenta accreta for the delivery.

Incorrect Answers: A, C, and D.

Amniotic fluid embolism (Choice A) is a rare and potentially fatal complication of childbirth caused by amniotic fluid entering the maternal circulation. While amniotic fluid embolism is more common in patients with abnormal placentation, including placenta previa, this complication remains rare.

Pulmonary embolism (Choice C) is more common in gravid patients because of the hypercoagulable state associated with pregnancy. Placenta previa is not associated with an increased risk of pulmonary embolism.

Vasa previa (Choice D) is a rare condition that may be associated with placenta previa, although it is more commonly associated with velamentous cord insertion and low-lying or multilobate placentas.

Educational Objective: The most significant risk factors for placenta accreta are prior caesarean delivery and the presence of placenta previa. In women with previa who have had numerous prior cesarean deliveriess the risk of placenta accreta is increased. Large cohort studies have determined that in the presence of previa the risk of accreta is 3%, 11%, 40%, 61%, and 67% for women with one, two, three, four, and five or more prior cesarean deliveries, respectively.

27. A 32-year-old woman comes to the physician because of a 1-week history of vaginal odor and a gray vaginal discharge. Over-the-counter clotrimazole therapy has not resolved her symptoms. Seven days ago, she completed a 14-day course of antibiotic therapy for an ear infection; she does not recall the name of the medication. Menses occur at regular 28-day intervals. She is sexually active with one male partner; they use condoms consistently. Physical examination shows no abnormalities. Pelvic examination shows an erythematous vagina and thin, gray vaginal discharge. The uterus is nontender and normal in size and shape. There is no adnexal tenderness. Which of the following is the most appropriate next step in management?

A) Wet mount preparation of the discharge
B) Culture of the discharge
C) Culture of the urine
D) Metronidazole therapy
E) Terconazole therapy

Correct Answer: A.

Bacterial vaginosis is a common gynecologic condition characterized by a shift of vaginal flora and overgrowth of a particular bacterial species, most commonly *Gardnerella vaginalis*. This often occurs in the setting of systemic antibiotic therapy. Bacterial vaginosis presents with gray, thin, malodorous vaginal discharge. Vaginal pH is increased over 4.5, and addition of KOH to the discharge produces a fish-like odor. The identification of clue cells on wet mount preparation is diagnostic and is thus the most appropriate next step in this patient's management. Metronidazole is the first-line therapy, which may be applied as a vaginal gel. Bacterial vaginosis is not considered a sexually transmitted infection and treatment of asymptomatic sexual partners is not recommended.

Incorrect Answers: B, C, D, and E.

Culture of the discharge (Choice B) can be used to diagnose infections of the vagina, cervix, and uterus, such as pelvic inflammatory disease caused by *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. This more commonly presents with foul-smelling mucopurulent vaginal discharge, cervical motion tenderness, cervical inflammation, and abdominopelvic pain.

Culture of the urine (Choice C) is used to diagnose a urinary tract infection, which typically presents with urinary frequency and urgency, dysuria, suprapubic discomfort, and occasionally, hematuria. This patient's symptoms are more consistent with bacterial vaginosis, for which a urine culture is not warranted.

Metronidazole therapy (Choice D) would be the appropriate treatment for this patient's bacterial vaginosis. However, the diagnosis should be confirmed with wet mount preparation of the discharge prior to initiating treatment.

Terconazole therapy (Choice E) is an antifungal treatment most commonly used for the topical treatment of vulvovaginal candidiasis. Candidiasis presents with vulvovaginal erythema, pruritus, and thick, white vaginal discharge, rather than the thin gray discharge seen in bacterial vaginosis. After addition of KOH, it can be diagnosed on microscopy with the visualization of pseudohyphae.

Educational Objective: Bacterial vaginosis is caused by the vaginal overgrowth of *G. vaginalis*, often in antibiotic use. It presents with gray, thin, malodorous vaginal discharge, a vaginal pH greater than 4.5, and a fish-like odor upon addition to KOH to the discharge. Clue cells on wet mount preparation are diagnostic. Treatment with metronidazole is first-line therapy.

28. A previously healthy 32-year-old woman comes to the physician because of a 17-kg (37-lb) weight gain over the past year. During this period, menses have occurred at irregular intervals with light flow. She bruises easily. Her blood pressure is 152/96 mm Hg while sitting. Examination shows dark facial hair on the chin and lateral cheeks and a fat pad at the dorsal base of the neck. Abdominal examination shows violaceous striae and truncal obesity. Her extremities are thin. There are a few old bruises on the forearms and 1+ pitting edema at both ankles. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of serum ACTH concentration
B) Measurement of serum corticotropin-releasing hormone concentration
C) Measurement of 8:00 AM serum cortisol concentration
D) 24-Hour urinary collection for measurement of free cortisol
E) CT scan of the adrenal glands

Correct Answer: D.

24-hour urinary collection for measurement of free cortisol is the most appropriate next step in diagnosis. This previously healthy patient with recent weight gain, irregular menses, hypertension, terminal hair growth, abdominal striae, and truncal obesity has features that are most consistent with Cushing syndrome. Cushing syndrome describes a pathologic state of excess cortisol production and may be caused by either an adrenocorticotropic hormone (ACTH) secreting pituitary tumor (Cushing disease) or may be secondary to the ectopic production of adrenocorticotropic hormone from a tumor elsewhere in the body. There are three tests that can be used to diagnose Cushing syndrome: measurement of 24-hour urine free cortisol, late night salivary cortisol concentration, or the use of the overnight dexamethasone suppression test. Urinary cortisol collection has traditionally been considered the gold standard, and patients with unequivocal hypercortisolism will have a 24-hour cortisol concentration greater than three times the upper limit of normal. After the diagnosis of Cushing syndrome is established, further assessment should focus on identifying the source of adrenocorticotropic hormone production. Most adrenocorticotropic hormone-producing pituitary adenomas will decrease their secretion of adrenocorticotropic hormone in response to high doses of dexamethasone while most ectopic adrenocorticotropic hormone-producing tumors are completely resistant. Therefore, a dexamethasone suppression test is usually the next step in diagnosis. Imaging is used to localize the tumor and plan for surgery.

Incorrect Answers: A, B, C, and E.

Measurement of serum ACTH concentration (Choice A) is helpful in distinguishing between Cushing disease and ectopic adrenocorticotropic hormone production, but is only measured after the diagnosis of hypercortisolism has been established.

Measurement of serum corticotropin-releasing hormone concentration (Choice B) is impractical as this hormone is released by the hypothalamus and acts on the pituitary. Sampling from the hypothalamic-hypophyseal portal is high risk and impractical as a result of the deep location within the skull.

Measurement of 8:00 AM serum cortisol concentration (Choice C) is a test used to screen for adrenal insufficiency, not for Cushing syndrome.

CT scan of the adrenal glands (Choice E) may eventually be required for tumor localization, but only after a pituitary tumor has been excluded with biochemical tests.

Educational Objective: Cushing syndrome refers to a state of excess cortisol production. If the adrenocorticotropic hormone-producing tumor is localized to the pituitary gland then it is called Cushing disease. The initial diagnosis of Cushing syndrome is made by measuring the 24-hour urinary cortisol level, which will be increased, or by measuring the late-night salivary cortisol concentration. Alternatively, a low-dose overnight dexamethasone suppression test can be used.

29. A 62-year-old man with alcoholism has blurred vision 3 weeks after treatment of an intra-abdominal abscess secondary to diverticulitis with perforation. He underwent diverting colostomy, colon resection, and abscess drainage. His postoperative course has been complicated by three episodes of sepsis successfully treated with broad-spectrum antibiotics. He is tolerating a regular diet. His temperature is 37.8°C (100°F), pulse is 85/min, respirations are 14/min, and blood pressure is 130/80 mm Hg. Funduscopic examination shows patchy white infiltrates bilaterally and no papilledema. The remainder of the neurologic examination shows no abnormalities. Which of the following is the most likely cause of this patient's visual problems?

A) Alcohol withdrawal
B) Brain abscess
C) Candidal ophthalmitis
D) Vitamin B_1 (thiamine) deficiency
E) Vitamin B_{12} (cobalamin) deficiency

Correct Answer: C.

Candidemia is frequently encountered in patients with a history of central line placement, hemodialysis, or other illnesses that create an increased risk of polymicrobial bloodstream infections, such as a perforated intra-abdominal abscess. Bloodstream infection with a variety of species of Candida, including *C. albicans*, *C. glabrata*, and *C. tropicalis* may result in intraocular seeding of yeasts. Intraocular candidal infection can manifest as chorioretinitis, characterized by focal, white patches of candidal infection within the retina and choroid, or endophthalmitis, in which there is additional involvement of the vitreous humor. Recent meta-analyses suggest that candidal endophthalmitis occurs at a rate of 1-2% in asymptomatic patients with candidemia. The Infectious Diseases Society of America 2016 Guidelines recommend routine ophthalmic screening with a dilated examination for all patients with candidemia. However, this remains controversial, as recent, large, studies in ophthalmologic literature have questioned the utility of routine screening exams in asymptomatic patients, given the rarity of intraocular seeding and lack of evidence that either early detection, intra-ocular antifungals, or surgical intervention have beneficial effects on visual outcomes. However, given that candidemia is typically encountered in the setting of severe systemic illness, many patients are unable to report visual symptoms. The majority of patients with intraocular candidal infections can be treated with oral or intravenous systemic antifungals, including with azoles, polyenes, or echinocandins, which all have excellent intraocular penetration. Patients with severe or refractory infection may require intraocular antifungal treatment or vitrectomy.

Incorrect Answers: A, B, D, and E.

Alcohol withdrawal (Choice A) typically presents with tremors, anxiety, restlessness, hyperreflexia, headache, nausea, autonomic instability, and diaphoresis, which can occur hours after the cessation of alcohol use. Blurry vision and patchy retinal infiltrates are not suggestive of alcohol withdrawal.

Brain abscess (Choice B) as a result of candidal infection can occur in immunocompromised patients. These are typically microabscesses that can lead to the development of encephalopathy with altered mental status and are seen on imaging as small, ring-enhancing lesions often with a hemorrhagic component. However, these patients commonly present with fever, nuchal rigidity, confusion, and headache, which this patient does not demonstrate.

Vitamin B_1 (thiamine) deficiency (Choice D) may lead to Wernicke-Korsakoff syndrome, often in alcohol use disorder. Wernicke-Korsakoff syndrome is characterized by altered mental status, ophthalmoplegia, nystagmus, ataxia, and retrograde and anterograde amnesia. Objective fundoscopic examination findings suggest an alternate diagnosis.

Vitamin B_{12} (cobalamin) deficiency (Choice E) can lead to subacute combined degeneration, which affects the spinocerebellar tracts, lateral corticospinal tracts, and dorsal columns, or to megaloblastic anemia. Blurry vision and patchy retinal infiltrates are not suggestive of vitamin B_{12} deficiency.

Educational Objective: Bloodstream infection with *Candida* species, including *C. albicans*, *C. glabrata*, and *C. tropicalis* may result in intraocular seeding of yeasts. Intraocular candidal infection can manifest as chorioretinitis or endophthalmitis. Routine screening examinations in asymptomatic patients with candidemia remain controversial. The majority of patients with intraocular candidal infections can be treated with oral or intravenous systemic antifungals.

30. A study is conducted to assess the prevalence of cataracts in all active United States Navy personnel compared with all active Army personnel. The medical records of all active Navy and Army personnel are reviewed for the diagnosis of cataracts. It is most appropriate to calculate which of the following to describe the data obtained in this study?

A) Prevalence ratio
B) Prevalence ratio ± standard deviation
C) Prevalence ratio ± standard error
D) Prevalence ratio + 90% confidence interval (CI)
E) Prevalence ratio + 99% CI

Correct Answer: A.

Prevalence defines the number of cases of a disease or condition as a fraction of a population in consideration at a point-in-time. Prevalence indicates the percentage of current cases of a condition within the population under study. Mathematically, prevalence is calculated by dividing the number of existing cases by the number of people in the population under study or at risk for the condition. In this case, the condition or disease under study is cataracts, and the population in question is active United States Navy (or Army) personnel. When seeking to compare prevalence across populations, the prevalence ratio, or the prevalence of the condition within one population divided by the prevalence of the condition in another population, can be calculated. A prevalence ratio greater than 1.0 indicates that the condition is more prevalent in the population making up the numerator or less prevalent in the population making up the denominator. A prevalence ratio less than 1.0 indicates that the condition is less prevalent in the population making up the numerator, or more prevalent in the population making up the denominator. Since the study seeks to assess the prevalence of the condition at a point in time, and is not extrapolating data to a generalized population, measures of statistical accuracy such as standard deviation, standard error, and confidence intervals do not apply.

Incorrect Answers: B, C, D, and E.

Prevalence ratio ± standard deviation (Choice B) would be used in comparing several values of prevalence ratios. Standard deviation is a measure of the degree of dispersion of data points about the mean and is defined as the square root of the variance. In a Gaussian distribution, one standard deviation above and below the mean will include approximately 68% of data points, while two standard deviations above and below the mean will include approximately 95% of data points. Multiple data points must exist, distributed about a mean in order to calculate a standard deviation. In this case, only one point, the prevalence ratio, is calculated. Similarly, the standard error (Choice C) is a function of the standard deviation and would not apply to a single calculation. Additionally, this dataset would include binary variables (eg, yes/no) as opposed to a continuous dataset; a Gaussian distribution would not be used to analyze such a dataset.

Prevalence ratio + 90% (or 99%) confidence interval (Choices D and E) also requires the use of standard deviation, which would not apply to a single computed ratio. Multiple values would need to populate a dataset to compute a standard deviation and variance across datapoints.

Educational Objective: Prevalence ratios can be used to compare the prevalence of a condition within one population against another population. A prevalence ratio greater than 1.0 indicates that the condition is more prevalent in the population making up the numerator or less prevalent in the population making up the denominator. A prevalence ratio less than 1.0 indicates that the condition is less prevalent in the population making up the numerator, or more prevalent in the population making up the denominator.

31. A study is conducted to compare the prevalence of dental caries in a community that drinks fluoridated water (Community A) with that in a community that drinks nonfluoridated water (Community B). Two thousand children ranging in age from 4 to 12 years are observed for 1 year. Subjects in the two community study groups are matched by age, gender, socioeconomic status, and dental insurance coverage. The results show:

	Community A	Community B	Total
Number of Children with Caries	200	500	700
Number of Children without Caries	800	500	1300
Total	1000	1000	2000

Which of the following is the most accurate interpretation of these results?

A) The results are invalid because of a randomization error

B) The results are invalid because of selection bias

C) The risk for development of dental caries in Community B is 1.6 times greater than that in Community A

D) The risk for development of dental caries in Community B is four times greater than that in Community A

E) The risk for development of dental caries was reduced by 40% in Community A compared to Community B

F) The risk for development of dental caries was reduced by 60% in Community A compared to Community B

Correct Answer: F.

This prospective cohort study uses relative risk to evaluate the risk of developing caries (outcome) associated with an exposure (fluoridated water). Relative risk (RR) describes the difference in likelihood of the occurrence of a particular disease outcome between two groups of patients with or without a particular exposure. Calculations of RR are commonly performed in cohort studies. RR is calculated by dividing the fraction of patients with a positive exposure and who developed disease (a) amongst all patients who were exposed which includes those exposed who did not develop disease (b), (a + b), by the fraction of patients with a negative exposure and who developed disease (c) amongst all patients who were not exposed which includes those who did not develop disease (d), (c + d). RR thus equals (a / (a + b)) / (c / (c + d)). In this case, the RR is calculated as follows: RR = (200 / (200 + 800)) / (500 / (500 + 500)) = 0.20 / 0.50 = 0.4. RR values greater than 1.0 indicate an increased risk of developing disease in association with the exposure, whereas values less than 1.0 indicate a reduced risk of developing disease, and RR equal to 1.0 indicates that the disease outcome and the exposure are not associated in any particular direction. A relative risk of 0.4 indicates that persons with the exposure are only 40% as likely to develop caries as compared to those without the exposure, or, 60% less likely (1.0 - 0.4 = 1 - RR). This calculation is known as relative risk reduction. By contrast, the absolute risk reduction in this case is computed as the risk in community B minus the risk in community A = 0.5 - 0.2 = 0.3.

Incorrect Answers: A, B, C, D, and E.

The results are invalid because of a randomization error (Choice A) or because of selection bias (Choice B) are not applicable; the sample of this study compared one community to another and was a convenience sample for which randomization would not have occurred and for which selection was purely based on living within a community. Characteristic matching (eg, age, gender) was performed. The results may be limited regarding generalizability, but they are not invalid.

The risk for development of dental caries in Community B is 1.6 times greater (Choice C) or four times greater (Choice D) than that in Community A are incorrect. The risk in Community B as compared to Community A is 0.50 / 0.20 = 2.5 times greater.

The risk for development of dental caries was reduced by 40% in Community A compared to Community B (Choice E) reflects a mathematical error or misapplication of the data. The risk of developing dental caries in Community A is 40% of the risk in Community B, however this reflects a 60% reduction in risk, not a 40% reduction.

Educational Objective: Relative risk (RR) describes the risk of developing a disease in a group with a particular exposure divided by the risk of developing a disease in a group without the exposure. RR is calculated as (a / (a + b)) / (c / (c + d)). Relative or absolute risk reduction can be used to evaluate the risk within one population as compared to another.

32. A case-control study is conducted to determine if the relationship between estrogen replacement therapy (ERT) and the risk for breast cancer is affected by estrogen formulation. Cases consist of 705 women with a history of breast cancer; controls consist of 692 randomly selected, age-matched women. All participants range in age from 55 to 74 years. Researchers record the following ERT data from participants and stratify the data accordingly: cumulative dosage, type of formulation, and duration of treatment. Researchers also record patient height and weight, family history of breast cancer, and reproductive history. Results show that the type of estrogen formulation does not affect the risk for breast cancer. Which of the following raises the most concern regarding the validity of this conclusion?

A) Inadequate number of controls
B) Inclusion of premenopausal women
C) Lack of matching on cumulative dosage
D) Patient recall bias
E) Pharmacologic differences among estrogen products

Correct Answer: D.

Recall bias may affect the results of this study. Recall bias occurs when participants do not remember or omit details or experiences related to previous or related events. It is a potential source of bias in retrospective studies, especially those in which the exposure may have occurred many years ago, which is common when diseases under study have long latency periods (eg, malignancy). It is feasible that a 74-year-old patient who may have taken ERT around age 50 years may not remember the brand, dosing, duration, or formulation correctly. Additionally, recall bias has been shown in studies to affect cases; many patients who are affected with a disease may falsely remember or confabulate that they must have been exposed in a manner that resulted in the disease outcome. It is possible that bias in this study prevents drawing of a correct conclusion about the risk of estrogen formulation and breast cancer.

Incorrect Answers: A, B, C, and E.

Inadequate number of controls (Choice A) is unlikely – the number of cases and controls are reasonably matched; fewer than 2% less controls are in the group. Additionally, while no information is provided to compute the sample size for appropriate power or effect, a study that includes hundreds or thousands of participants is likely appropriately powered. It cannot be concluded that the controls are inadequate as appropriately as the presence of recall bias can be inferred.

Inclusion of premenopausal women (Choice B) may potentially bias the study; however, no information is provided about their inclusion or exclusion. Additionally, provided that a comparable number of premenopausal women was included in the case and control groups, any influence would likely be controlled out. The average age of menopause is roughly 50-51 years old, with noted variability for ethnicity and smoking history; most participants in this study were likely menopausal.

Lack of matching on cumulative dosage (Choice C) cannot be reasonably concluded based on the information provided – patients were stratified by their cumulative dosage according to the information provided.

Pharmacologic differences among estrogen products (Choice E) are possible but cannot be concluded from the information given. Additionally, given the mixture of patients in the cases and controls, such differences would likely be controlled out.

Educational Objective: Recall bias occurs when participants do not remember or omit details or experiences related to previous or related events. It is a potential source of bias in retrospective studies, especially those in which the exposure may have occurred many years ago, which is common when diseases under study have long latency periods.

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33. Studies of a new intravenous fluid that acts as a plasma expander have shown positive results in laboratory animals. An emergency department (ED) physician believes that the new fluid could save human lives and wants to research its effects on critical trauma patients who require urgent care in the ED. Because the most critical patients are often unable to provide informed consent, which of the following best describes how the ED physician should proceed with his research?

A) Acquire a court injunction to proceed with research

B) Apply to the institutional review board for approval

C) Continue without informed consent

D) Obtain informed consent from a critical patient's family member

E) Use the new fluid only in patients who can provide informed consent

Correct Answer: B.

This physician should apply to the institutional review board (IRB) for approval to conduct the study. IRBs, also known as ethics review boards or research ethics boards, are established committees that review proposed human-subjects research to ensure that studies are reasonably safe and ethical. IRBs approve, reject, and monitor human-subjects research, and ensure that the welfare and rights of participants are maintained and protected. IRBs were established following several ethically questionable research experiments in the twentieth century, including the Tuskegee syphilis study, and the Milgram obedience experiment. Following these (and many other) questionably ethical experiments, the requirement for IRBs emerged. IRBs may approve research for which the benefits to society balance or outweigh any individual risks to the participants. Similarly, subjects must be fairly selected, and the risks and benefits must be considered to the individuals in the studies. Informed consent processes must occur with the exception of when studies present minimal risk to the participants (eg, educational studies). In this example, patients will be unable to consent, and the IRB should consider whether this study presents an acceptable level of risk to participants as compared to the standard available therapy when deciding whether to approve it. If approved, interval monitoring should occur as results come available, and the study stopped if statistically significant harm is occurring to participants.

Incorrect Answer: A, C, D, and E.

Acquire a court injunction to proceed with the research (Choice A) is neither practical nor appropriate – well-established guidelines for performing research and obtaining approvals for such exist. The judicial system does not generally play any primary role in medical research.

Continue without informed consent (Choice C) would be a violation of ethical principles of autonomy and may also violate the principles of beneficence, nonmaleficence, and justice. Ethically, patients have a right to decide what care they would like to receive, and what risks they are willing to take with their own bodies.

Obtain informed consent from a critical patient's family member (Choice D) may be acceptable in surrogacy for the patient's decision making, however it would not take the place of IRB evaluation of the study first and foremost. Additionally, the IRB would have to evaluate whether such surrogacy would be acceptable in the setting of critical illness.

Use the new fluid only in patients who can provide informed consent (Choice E) may be an intermediate step in the experiment following IRB approval, but it may also result in a selection bias of subjects who were less critically ill than those unable to consent, in whom the largest benefit may be seen.

Educational Objective: IRBs are established committees that review proposed human-subjects research to ensure that studies are reasonably safe and ethical. IRBs approve, reject, and monitor human-subjects research, and ensure that the welfare and rights of participants are maintained and protected.

34. A 25-year-old woman comes to the physician for an initial prenatal examination at 12 weeks' gestation. She has schizoaffective disorder and had been taking oral haloperidol sporadically until 2 months ago. She says that she was impregnated by evil and that she needs to get rid of the "Devil's baby." She states that she hears "angelic voices telling me to get an abortion." She says that she likes children and has two of her own but "obviously cannot have this one because it is evil!" She demands an abortion. Physical examination shows a uterus consistent in size with a 12-week gestation. On mental status examination, she is agitated. In addition to admitting the patient to the hospital, which of the following is the most appropriate next step in management?

A) Defer the decision about abortion and observe the patient
B) Defer the decision about abortion and begin valproic acid
C) Defer the decision about abortion and resume haloperidol
D) Arrange for an abortion and begin valproic acid
E) Arrange for an abortion and resume haloperidol
F) Arrange for an abortion and resume haloperidol after the abortion

Correct Answer: C.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. This patient's religious delusions and auditory hallucinations are disrupting her reasoning about keeping the pregnancy versus obtaining an abortion. For patients who do not possess decisional capacity, physicians should defer non-urgent medical decisions while attempting to restore the patient's decisional capacity. To restore this patient's decisional capacity, the physician should treat the patient's acute psychotic symptoms with antipsychotic medication. Antipsychotic medication is the most effective treatment for acute psychotic symptoms in patients with chronic psychotic disorders such as schizoaffective disorder. In patients with psychotic episodes secondary to poor medication adherence and a history of stability on that medication, resuming the effective medication is indicated.

Incorrect Answers: A, B, D, E, and F.

Deferring the decision about abortion and observing the patient (Choice A) or beginning valproic acid (Choice B) would likely lead to persistence of the patient's delusions and would not restore her decisional capacity about the abortion. Delusions in patients with bipolar disorder who are experiencing acute mania with psychotic features may improve with mood stabilizer medication (eg, valproic acid), as the psychotic symptoms are conceptualized as being secondary to mania. However, patients with chronic psychotic disorders such as schizoaffective disorder typically require antipsychotic medication, not mood stabilizers, to address their psychotic symptoms. Further, valproic acid is contraindicated in the first trimester because of teratogenic effects.

Arranging for an abortion (Choices D, E, and F) would be inappropriate as the patient does not possess decisional capacity. Beginning valproic acid, a mood stabilizer medication, would be less likely than an antipsychotic medication to resolve this patient's psychotic symptoms given her underlying chronic psychotic disorder. Further, valproic acid is contraindicated in the first trimester because of teratogenic effects.

Educational Objective: Psychotic symptoms can interfere with a patient's decisional capacity. For patients who do not possess decisional capacity, physicians should defer non-urgent medical decisions while attempting to restore the patient's decisional capacity. Antipsychotic medication is the most effective treatment for acute psychotic symptoms in patients with chronic psychotic disorders such as schizoaffective disorder.

35. A 47-year-old woman with a 1-month history of rheumatoid arthritis comes to the physician for a follow-up examination. She has had moderate fatigue and morning joint stiffness. Current medications include ibuprofen and prednisone. There is swelling, tenderness, and decreased range of motion of the wrist and proximal interphalangeal joints bilaterally. Test of the stool for occult blood is negative. Laboratory studies show:

Hematocrit	31%
Mean corpuscular volume	85 μm^3
Serum	
Iron	55 µg/dL
Total iron-binding capacity	200 µg/dL (N=250–400)

X-rays of the hands show bony erosions of the proximal interphalangeal joints bilaterally. Which of the following is the most appropriate next step in management?

A) Analgesic therapy
B) Blood transfusion
C) Discontinuation of drug therapy
D) Erythropoietin therapy
E) Exchange transfusion
F) Folic acid supplementation
G) Hydroxyurea therapy
H) Iron supplementation
I) Methotrexate therapy
J) Vitamin B_{12} (cyanocobalamin) supplementation

Correct Answer: I.

Methotrexate therapy should be initiated in this patient with rheumatoid arthritis (RA) and clear evidence of active disease, as evidenced by symptoms of inflammatory joint pain with synovitis and joint erosions on x-ray. RA is a rheumatologic disease that can lead to debilitating joint abnormalities, and early initiation of disease modifying antirheumatic drugs (DMARDs) such as methotrexate are indicated in almost all cases. Early initiation of DMARDs can prevent or stall the progression to destructive joint disease. Methotrexate, when compared to other non-biologic DMARDs, also decreases the risk of cardiovascular disease in patients with RA. Occasionally methotrexate is combined with other medications such as sulfasalazine and hydroxychloroquine (known as triple therapy) when disease activity remains high, but patients may also be rapidly switched to biologic medications such as adalimumab or etanercept. With appropriate treatment of her underlying condition, this patient's anemia (likely anemia of chronic disease) will also likely improve over time.

Incorrect Answer: A, B, C, D, E, F, G, H, and J.

Analgesic therapy (Choice A) is appropriate in this patient with inflammatory joint pain, but this should be given in addition to an appropriate DMARD.

Blood transfusion (Choice B) is unlikely to help this patient with anemia of chronic disease and no evidence of acute blood loss.

Discontinuation of drug therapy (Choice C) is incorrect. Ibuprofen is appropriate for this patient and discontinuation of prednisone may make her symptoms even worse.

Erythropoietin therapy (Choice D) is indicated for patients with end stage kidney disease and anemia refractory to iron therapy. This patient does not fit these criteria.

Exchange transfusion (Choice E) is indicated for patients with severe complications of sickle cell disease such as acute chest syndrome, stroke, or priapism.

Folic acid supplementation (Choice F) should be given in conjunction with methotrexate but will not affect this patient's disease activity level.

Hydroxyurea therapy (Choice G) is indicated for patients with sickle cell disease to reduce the incidence of vaso-occlusive pain crises.

Iron supplementation (Choice H) is unlikely to improve this patient's anemia. Anemia of chronic disease is a disorder of iron utilization, not a disease of iron deficiency.

Vitamin B_{12} (cyanocobalamin) supplementation (Choice J) would be appropriate if this patient had macrocytic anemia and a decreased vitamin B_{12} concentration.

Educational Objective: Early treatment of RA with a DMARD such as methotrexate is nearly always indicated in order to reduce the risk of destructive joint disease. Other manifestations of RA such as anemia of chronic disease are likely to improve as well with appropriate treatment.

36. A 27-year-old woman who received the diagnosis of multiple sclerosis 8 months ago comes to the physician because of severe fatigue during the past 2 months. She currently experiences double vision and vertigo once or twice weekly, but her most problematic symptom is persistent fatigue. She says that there has been no change in her sleep pattern. She eats five servings of vegetables daily and drinks one glass of wine in the evening. She exercises three times weekly; her regimen consists of 30 minutes of running outdoors. She notes that it has been a particularly hot summer and says that the heat bothers her more than it used to. She has no other history of serious illness. Current medications include interferon beta and a multivitamin. Physical examination shows no abnormalities. Which of the following is the most appropriate recommendation to decrease this patient's fatigue?

A) Avoid outdoor activity on hot days
B) Discontinue alcohol consumption
C) Increase the frequency of exercise
D) Switch to a high-protein/low-carbohydrate diet
E) Increase the dosage of interferon beta

Correct Answer: A.

Multiple sclerosis (MS), the most prevalent immune-mediated demyelinating disease, may present with episodic or progressive focal neurological dysfunction including sensory loss, weakness, bladder or bowel dysfunction, or cognitive impairment. Fatigue is also common in MS and may be primary (related to proinflammatory cytokines) or secondary to medication, depression, sleep disturbances, or motor disability leading to increased energy expenditure. Most patients with MS experience heat sensitivity, during which small increases in body temperature lead to transient increases in symptom severity (as a result of poor conduction by demyelinated nerves in high temperatures). MRI typically shows white matter hyperintensities in the periventricular region, cortex, subcortical region, cerebellum, or spine. Treatment includes corticosteroids for symptomatic management of acute flares and long-term disease-modifying treatments such as interferon or monoclonal antibodies. Cooling techniques (eg, cold drinks, lightweight clothing, air conditioning, ice packs, cooling suits) may improve heat-related exacerbations. Lifestyle modifications that apply to all patients such as maintaining a balanced diet, regular exercise, and avoiding excessive alcohol use are also recommended for MS patients to reduce neuroinflammation.

Incorrect Answers: B, C, D, and E.

Discontinuing alcohol consumption (Choice B) is unnecessary. Patients with MS should avoid heavy drinking, though low risk drinking (eg, seven or fewer drinks weekly for women) is not a significant risk factor for MS exacerbation.

Increasing the frequency of exercise (Choice C) is unlikely to significantly improve this patient's MS symptoms, as the duration of this patient's cardiovascular exercise aligns with exercise recommendations for MS. As well, this patient's MS exacerbation correlates with increased environmental temperature.

Switching to a high-protein/low-carbohydrate diet (Choice D) is unlikely to improve this patient's MS symptoms, who already adheres to a healthy diet. As well, certain proteins have been associated with MS exacerbation via antibody cross-reactivity.

Increasing the dosage of interferon-beta (Choice E) would be unnecessary in this patient who is likely experiencing a transient MS exacerbation related to increased environmental temperature.

Educational Objective: MS is an autoimmune demyelinating disease that presents with episodic or progressive focal neurological deficits. Fatigue is also common. Most patients with MS experience transient symptom exacerbation in high environmental temperatures, which may be addressed with cooling techniques.

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37. A 22-month-old boy is brought to the physician because of a 2-week history of difficulty sleeping. His parents note that each night he awakens screaming 1 to 2 hours after falling asleep and cannot be consoled. During these episodes, he sits or stands in the crib with his eyes open but does not focus his eyes on them. After 10 minutes, the episode resolves, and he falls asleep. He has asthma treated with nebulized albuterol. His maternal cousin has benign rolandic epilepsy of childhood. The patient is above the 95th percentile for head circumference. Examination shows a prominent forehead. The anterior fontanelle cannot be palpated. EEG shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Reassurance

B) Add acetazolamide to the medication regimen

C) Add carbamazepine to the medication regimen

D) Add propranolol to the medication regimen

E) Discontinue albuterol therapy

Correct Answer: A.

Sleep terror disorder is a common sleep disorder characterized by recurrent episodes of sympathetic hyperactivity (eg, tachycardia, diaphoresis) and vocalizations (eg, screams) during non-REM sleep within the first 2 hours of falling asleep. Patients are typically unaware and unarousable during the episode and amnestic to the episode afterward. The pathogenesis is unclear but may be related to stress and is thought to represent a mixing of non-REM sleep and wakefulness states. These episodes can emerge in toddlerhood and typically resolve spontaneously by adolescence. Seizure disorder should be excluded by EEG in high-risk patients, though this cause is rare. Management involves parent education and reassurance.

Incorrect Answers: B, C, D, and E.

Acetazolamide (Choice B) is a carbonic anhydrase inhibitor that acts as a diuretic and indirectly decreases cerebrospinal fluid production in the choroid plexus. It is not indicated for sleep terror disorder.

Carbamazepine (Choice C) is an anticonvulsant and mood stabilizer medication utilized to treat seizure disorders and bipolar disorder. This patient's EEG shows no abnormalities, supporting sleep terror disorder rather than a seizure disorder. Though sleep terrors may mimic seizures, it would be atypical for a seizure to last more than 2 minutes. As well, seizures commonly include stereotyped movements or tonic stiffening, and may occur at any sleep stage.

Propranolol (Choice D), a β-adrenergic blocker medication, is utilized for performance anxiety and traumatic brain injury-related agitation. It has been associated with nightmares and is not indicated for the treatment of sleep terror disorder.

Albuterol (Choice E), a β_2-adrenergic agonist, may lead to insomnia given its sympathomimetic properties. However, it has not been associated with sleep terror disorder.

Educational Objective: Sleep terror disorder is a common sleep disorder characterized by recurrent episodes of sympathetic hyperactivity and vocalizations during non-REM sleep. These episodes can emerge in toddlerhood and typically resolve spontaneously by adolescence. Management involves parent education and reassurance.

38. A 47-year-old man comes to the physician because of a 6-month history of a lesion on his forehead. The affected area is not painful or itchy. Three years ago, he underwent a renal transplant for chronic renal failure secondary to IgA nephropathy. Examination of the left forehead shows a 2 x 0.5-cm, hyperkeratotic, erythematous, crusted plaque with areas of ulceration. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Actinic keratosis
B) Contact dermatitis
C) Lichen planus
D) Molluscum contagiosum
E) Squamous cell carcinoma

Correct Answer: E.

Squamous cell carcinoma is a common form of skin cancer and is derived from the epithelial cells of the epidermis. The primary risk factor for developing squamous cell carcinoma is ultraviolet light exposure, though immunosuppression, age, and family history also contribute. Solid organ transplant recipients are at significantly increased risk of developing squamous cell carcinomas because of chronic immunosuppression. Squamous cell carcinomas typically present as hyperkeratotic, crusted papules, plaques, or nodules, which may be ulcerated. The risk of metastasis increases with increasing size of the tumor and a location on the head and neck. Treatment of squamous cell carcinoma requires surgical removal,either via excision or Mohs micrographic surgery.

Incorrect Answers: A, B, C, and D.

Actinic keratosis (Choice A) is a premalignant lesion that may progress to squamous cell carcinoma. Clinically, lesions typically appear as light pink, ill-defined macules with a gritty texture in areas of prolonged sun exposure, such as the face, ears, and dorsal hands.

Contact dermatitis (Choice B) is an eczematous rash induced by either an irritant or allergen coming into contact with the skin. The rash of acute contact dermatitis will be erythematous, pruritic, and often have small vesicles or weeping serous fluid.

Lichen planus (Choice C) is an inflammatory dermatosis characterized by purple, polygonal, pruritic papules. Common locations for involvement include the ventral wrists, lower legs, and oral mucosa.

Molluscum contagiosum (Choice D) is a benign dermatosis induced by infection of epithelial cells with poxvirus. Lesions are characteristically umbilicated papules rather than hyperkeratotic or crusted nodules. While molluscum contagiosum is most commonly seen in children, as the virus is transmitted by skin-to-skin contact, immunocompromised individuals also have a higher risk of developing the condition.

Educational Objective: Squamous cell carcinoma is a common type of skin cancer, which has an increased prevalence in recipients of solid organ transplants. It tends to demonstrate a hyperkeratotic crust, which helps to distinguish it from basal cell carcinoma. Squamous cell carcinomas occurring on the head and neck in transplant recipients have an increased propensity for recurrence and metastasis.

39. A 62-year-old man comes for evaluation prior to undergoing total knee replacement. He has rheumatoid arthritis treated with prednisone. He has no known allergies. Examination shows pain with knee motion. Which of the following is the most appropriate management regarding prophylactic antibiotic therapy?

A) Parenteral cefazolin
B) Parenteral clindamycin
C) Parenteral penicillin and gentamicin
D) Parenteral vancomycin
E) No prophylactic antibiotics are indicated

Correct Answer: A.

Total knee replacement involves incision of the skin over the knee, dissection of connecting tissues, excision of the damaged joint, and replacement with a prosthetic. Patients should be medically optimized ahead of any surgical procedure to minimize the risk of postoperative complications such as bleeding or infection, which could result in failure of the surgery, the need to repeat a surgery, or systemic and life-threatening complications (eg, bacteremia). This patient has rheumatoid arthritis treated with prednisone, which results in iatrogenic immunocompromise as a result of the anti-inflammatory effect of corticosteroids on the immune system. As a result, he will be at higher risk for infection than an age- and comorbidity-matched patient not taking steroids. The skin acts as a natural immune barrier because of its thick keratinized layers, resident dendritic cells, macrophages, lymphocytes, pH, and lymphatic channels. Many bacteria colonize the surface of the skin, notably *Staphylococcus aureus* and *S. epidermidis*. When on the surface, these pathogens are harmless, however when displaced into the blood stream or soft tissues, rapid and significant infection can occur. Ahead of any surgery that requires the incision of skin, prophylactic antibiotics should be administered to limit the likelihood of infection should any inoculation occur. Antibiotics should be chosen to cover the common pathogens that may be present; in this case, a first- or second-generation cephalosporin such as intravenous cefazolin, offers sufficient coverage against likely pathogens, especially Gram-positive *Staphylococcus* and *Streptococcus* species. Additional measures to limit inoculation should also occur, which include prepping the patient's skin in the usual sterile fashion, which generally includes cleansing with topical iodine or chlorhexidine solutions ahead of any incision.

Incorrect Answers: B, C, D, and E.

Parenteral clindamycin (Choice B), penicillin and gentamicin (Choice C), and vancomycin (Choice D) would all offer coverage against many pathogens and in some cases may be appropriate in cases where a patient has a severe or fatal allergic reaction to cefazolin, however their breadth of coverage often extends beyond what is necessary, which risks creating antibiotic resistance in the patient (clindamycin, gentamicin). Additionally, penicillin by itself may be too narrow to sufficiently cover common cutaneous pathogens, and vancomycin itself is best reserved for cases of methicillin resistant Gram-positive organisms.

No prophylactic antibiotics are indicated (Choice E) is incorrect, as the standard of care in surgical therapy is to cover the patient with antibiotics for common pathogens encountered during the surgical approach. This is also the standard in gastrointestinal surgeries, however the choice of antibiotic switches to those having broad Gram-negative and anaerobic coverage (eg, ciprofloxacin and metronidazole).

Educational Objective: Perioperative antibiotics are administered ahead of surgeries to limit the risk of infection if the patient is inoculated with bacteria as a result of the surgical approach. Skin and soft tissue flora are generally covered by first- or second-generation cephalosporins.

40. A 42-year-old woman comes to the physician because of a lump in her left thigh since she fell on the ice while playing hockey 4 months ago. At that time, she noticed bruising on her left thigh that has resolved, but the lump has increased in size. She has not had fever, night sweats, or weight loss. She has no history of serious illness and takes no medications. Examination shows a 5 × 6-cm, painless, firm, soft tissue mass on the anterolateral aspect of the left thigh. The overlying skin is intact, and there is no discoloration. There is no inguinal lymphadenopathy. Distal pulses are normal, and sensation is intact. Range of motion of the hips and knees is full, and muscle strength is normal. X-rays of the left femur and knee show no abnormalities. An MRI of the left femur shows a deep soft tissue mass with inhomogeneous signal on T1- and T2-weighted images. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the thigh
B) Core-needle biopsy
C) Ultrasonography
D) Wide resection of the mass
E) Observation and reevaluation in 1 month

Correct Answer: B.

The most appropriate next step in the diagnosis of this patient's left thigh mass is a core-needle biopsy. Features of this patient's history and physical examination that raise concern for malignancy include the tumor's increasing size, lack of pain, and firmness. For this reason, the most important next step is to make a pathologic diagnosis, which will likely confirm a diagnosis of soft tissue sarcoma. Soft tissue sarcomas are a heterogenous group of tumors, which are derived from mesenchymal tissue such as skeletal or smooth muscle, adipose, or fibrous tissue. Malignant fibrous histiocytoma, now commonly referred to as undifferentiated pleomorphic sarcoma, is the most common type of soft tissue sarcoma. A gradually enlarging, painless mass within an extremity is the most common presentation of soft tissue sarcomas but they can develop in any location. In areas such as the thigh or retroperitoneum, the tumors can become very large prior to presentation. Metastasis is possible and tends to occur via hematogenous spread rather than lymphatic spread. Treatment of soft tissue sarcoma is based on tumor stage and includes both surgical and systemic therapies.

Incorrect Answers: A, C, D, and E.

CT scan of the thigh (Choice A) and ultrasonography (Choice C) could both be performed to better qualify the anatomy of the tumor but will not aid in providing a definitive pathologic diagnosis, which is required for treatment planning. After a diagnosis is made by biopsy, additional imaging may be helpful in surgical planning.

Wide resection of the mass (Choice D) is not yet indicated as definitive surgical management must be informed by a pathologic diagnosis. When suspecting malignancy of the skin or soft tissue, a biopsy for pathologic review must first be performed as treatment recommendations vary widely depending on the nature of the tumor.

Observation and reevaluation in 1 month (Choice E) is not appropriate in this case of a painless, firm mass, which has been increasing in size over a 4-month period. This is highly concerning for malignancy and cannot be attributed to her recent trauma. Delaying diagnosis and treatment of any neoplasm can lead to an increase in tumor stage, with an accompanying drop in prognosis.

Educational Objective: A gradually enlarging, painless mass within an extremity should raise concern for the presence of a soft tissue sarcoma. Core-needle biopsy is the most appropriate first step in confirming the pathologic diagnosis.

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41. A 14-year-old boy who has sickle cell trait is brought to the emergency department because of a 1-day history of severe pain in his left thigh and knee. He has been unable to bear weight on his left leg since the pain began. He has not had swelling, locking, or "catching" of his knee. Six days ago, he was evaluated in the emergency department after he twisted the knee during a basketball game. An x-ray of the knee taken at that time is shown. He was instructed to take a nonsteroidal anti-inflammatory drug and apply ice packs to the knee. He also was given crutches and told to bear weight as tolerated. His symptoms improved during the next 3 days, and he discontinued use of the crutches and medication at that time. On arrival, he is walking with the assistance of crutches. He is 173 cm (5 ft 8 in) tall and weighs 95 kg (210 lb); BMI is 32 kg/m^2. His temperature is 37°C (98.6°F), and blood pressure is 110/70 mm Hg. Examination of the left lower extremity shows joint line tenderness of the knee; there is no effusion. Range of motion of the left hip is limited by pain. The remainder of the examination shows no abnormalities. His leukocyte count is 8000/mm^3, and erythrocyte sedimentation rate is 10 mm/h. Which of the following is the most appropriate next step in management?

A) X-ray of the lumbar spine
B) X-ray of the left hip
C) Whole-body bone scan
D) MRI of the left knee
E) Aspiration of the left knee

Correct Answer: B.

X-ray of the left hip is the most appropriate next step in management of this patient with slipped capital femoral epiphysis (SCFE). SCFE most commonly occurs in overweight children between the ages of 10 to 15 years. It results in displacement of the femoral epiphysis relative to the femoral neck secondary to anterosuperior movement of the metaphysis as a result of a fracture of the growth plate. Factors that weaken the growth plate and may contribute to the development of SCFE include trauma, genetic predisposition, obesity, and endocrine or metabolic disorders that lead to altered cartilage growth and mineralization. The most common clinical presentation of SCFE is hip pain and impaired gait, both seen in this case. The diagnosis of SCFE is made with hip x-rays, with both frontal and frog-leg views necessary. Once the diagnosis of SCFE is confirmed, the patient should be made non-weight bearing and will need operative stabilization to prevent further displacement of the epiphysis. Pain often radiates to the knee which can confound the diagnosis.

Incorrect Answers: A, C, D, and E.

X-ray of the hip, not the lumbar spine (Choice A), will identify SCFE. Lumbar spine x-rays would identify pathologies such as ankylosing spondylitis, compression fractures, or spinal stenosis, but none of these are the cause of this patient's hip pain.

Whole-body bone scan (Choice C) is a nuclear medicine study that is used to further characterize a concerning osseous lesion or identify osteoblastic metastatic disease (eg, prostate and breast cancer). In this case, hip x-rays are the more appropriate first step in diagnosis.

MRI of the left knee (Choice D) is not necessary in this patient and would delay the diagnosis of SCFE, which requires urgent surgical management. This patient's left hip findings suggest that his knee pain may be related to his hip pathology rather than as a result of a primary knee process, thus further imaging of the knee is not necessary.

Aspiration of the left knee (Choice E) would be the next appropriate step in management if septic arthritis of the knee were suspected. Rather, the patient has no signs of septic arthritis such as fever, leukocytosis, or increased inflammatory markers.

Educational Objective: Slipped capital femoral epiphysis most commonly occurs in overweight children between the ages of 10 to 15 years and presents with hip pain and impaired gait. Diagnosis is made with hip x-rays. Urgent surgical stabilization is needed to prevent further displacement of the epiphysis.

42. An 87-year-old woman who is a resident of a skilled nursing care facility is brought to the physician by staff because of fever for 1 day. A urinary catheter was placed 2 weeks ago because of urinary incontinence. She has dementia, Alzheimer type, and is unable to communicate verbally. Her temperature is 37.8°C (100°F), pulse is 86/min, respirations are 14/min, and blood pressure is 120/74 mm Hg. Mucous membranes are moist and pink. Urinalysis shows:

Color	cloudy brown
pH	8.8
Blood	2+
Glucose	negative
Protein	2+
RBC	too numerous to count
WBC	20–25/hpf
Nitrites	3+
Leukocyte esterase	3+
Bacteria	many

A Gram stain of urine shows gram-negative bacilli. Which of the following measures is most likely to have prevented this patient's current condition?

A) Use of incontinence briefs instead of the catheter
B) Changing the catheter daily
C) Cleaning the urethral orifice with povidone-iodine daily
D) Flushing the catheter with an antibiotic solution daily
E) Oral antibiotic prophylaxis
F) Oral oxybutynin therapy

Correct Answer: A.

Use of incontinence briefs instead of a urinary catheter would most likely have reduced the chance of urinary tract infection (UTI) in this patient, which is the most likely diagnosis in this elderly woman with fever, pyuria, and urine Gram stain showing Gram-negative bacilli. Elderly patients, especially women and those with indwelling urinary catheters, are at an increased risk of UTI when compared to other populations. Many patients with UTI in the absence of urinary catheters will have symptoms of dysuria, frequency, and urgency, with laboratory studies consistent with the diagnosis, including pyuria, bacteriuria, and occasionally hematuria. Nitrites and leukocyte esterase may also be positive. The use of indwelling urinary catheters greatly increases the risk of UTI as the catheter acts as a direct conduit between the environment and the bladder. All patients with urinary catheters should be evaluated on a frequent basis to determine if continued use of the catheter is justified. Urinary catheters are typically not indicated for long term use in patients with urinary incontinence, and these patients should be switched to the use of absorbent pads.

Incorrect Answers: B, C, D, E, and F.

Changing the catheter daily (Choice B) is not necessary and may cause unnecessary urethral trauma. Additionally, this patient does not currently have a good indication for continued use of a catheter.

Cleaning the urethral orifice with povidone-iodine daily (Choice C) is not indicated. While the urethra should be cleaned prior to insertion, repeated use of iodine is unlikely to reduce the risk of UTI in patients with chronic indwelling catheters.

Flushing the catheter with an antibiotic solution daily (Choice D) is not indicated. Some patients with chronic indwelling catheters may require installation of antibiotics into the bladder, but this patient should have her catheter removed and her UTI treated with antibiotics.

Oral antibiotic prophylaxis (Choice E) is considered for patients with frequent UTIs, but this patient's catheter should be removed first and she should be monitored for recurrence before considering chronic prophylactic antibiotic therapy.

Oral oxybutynin therapy (Choice F) is used to treat overactive bladder syndrome. There is not enough information presented to determine if this patient would benefit from this medication, as the cause of her urinary incontinence is unknown.

Educational Objective: Indwelling urinary catheters greatly increase the risk of catheter associated UTIs. For patients who do not have necessary indications for the ongoing use of urinary catheters, such as this patient with urinary incontinence, the catheter should be removed. Use of incontinence pads greatly decreases the risk of UTI when compared to urinary catheters.

43. A 27-year-old woman, gravida 3, para 2, at 8 weeks' gestation comes to the physician for her first prenatal visit. She had an unknown sexually transmitted disease 1 year ago that was treated with penicillin. Her sexual partner was recently treated for nongonococcal urethritis. The uterus is consistent in size with an 8-week gestation. Speculum examination shows a heavy mucopurulent discharge and a friable cervix. Which of the following is the most appropriate pharmacotherapy?

A) Acyclovir
B) Azithromycin
C) Cefazolin
D) Gentamicin
E) Metronidazole
F) Penicillin
G) Spectinomycin

Correct Answer: B.

Acute cervicitis, or inflammation of the cervix, is most commonly caused by a sexually transmitted infection, specifically *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. However, it can also be caused by herpes simplex virus, bacterial vaginosis, and *Trichomonas vaginalis*, among other infections. It typically presents with postcoital spotting, purulent vaginal discharge, and dyspareunia, although it may be asymptomatic. Physical examination will demonstrate mucopurulent cervical discharge and punctate hemorrhages of the ectocervix that are friable. Laboratory studies includes nucleic acid amplification testing for sexually transmitted infections, in addition to testing for bacterial vaginosis and trichomoniasis. In this patient's case, she has been exposed to a sexual partner with nongonococcal urethritis, which is most commonly caused by *C. trachomatis*. Thus, this patient's cervicitis is most likely caused by *C. trachomatis*, and she should be treated with azithromycin. While doxycycline may also be used to treat *C. trachomatis*, it is contraindicated in pregnancy. Potential complications of acute cervicitis include pelvic inflammatory disease and endometritis.

Incorrect Answers: A, C, D, E, F, and G.

Acyclovir (Choice A) is a potent antiviral used for viral infections, such as herpes encephalitis or meningitis, and for mucocutaneous infections, such as genital herpes. This patient with exposure to nongonococcal urethritis, evidence of acute cervicitis, and no genital ulcers more likely has a chlamydial infection than a herpes simplex infection.

Cefazolin (Choice C) is a first-generation cephalosporin and is used in the treatment of primarily gram-positive bacterial infections, although it also treats gram-negative bacteria to a lesser degree, including *Escherichia coli*. It is often used for surgical prophylaxis and in the treatment of skin and soft tissue infections. It plays no role in the treatment of *C. trachomatis*.

Gentamicin (Choice D) is an aminoglycoside used primarily in the treatment of Gram-negative bacterial infections, such as that seen in complicated urinary tract infections. Aminoglycosides are contraindicated in pregnancy.

Metronidazole (Choice E) is used in the treatment of trichomoniasis, bacterial vaginosis, and pelvic inflammatory disease. Trichomoniasis presents with green-frothy purulent vaginal discharge, vaginal pruritus, and cervical inflammation, whereas bacterial vaginosis presents with thin gray vaginal discharge and a fish-like odor upon addition of KOH to the discharge. Pelvic inflammatory disease is caused by an ascending infection and presents with fever, purulent vaginal discharge, abdominopelvic pain, and cervical motion tenderness. Given her exposure and symptoms, this patient more likely has chlamydial cervicitis.

Penicillin (Choice F) is used in the treatment of Gram-positive cocci, Gram-positive rods, Gram-negative cocci, and anaerobes. It is not effective in the treatment of *C. trachomatis*.

Spectinomycin (Choice G) is an antibiotic with a similar mechanism of action as aminoglycosides. It is used primarily in the treatment of *N. gonorrhoeae* infections but plays no role in the treatment of *C. trachomatis* infections.

Educational Objective: *C. trachomatis* is a common cause of nongonococcal urethritis and acute cervicitis. Diagnosis is made with nucleic acid amplification testing, and treatment is with doxycycline or azithromycin; however, doxycycline is contraindicated in gravid patients.

44. A 27-year-old woman, gravida 1, para 1, comes to the physician for a routine health maintenance examination. She feels well, has no history of serious illness, and takes no medications. Eight months ago, she delivered a healthy newborn at term following spontaneous vaginal delivery. She stopped breast-feeding 2 months ago. She is 173 cm (5 ft 8 in) tall and weighs 66 kg (145 lb); BMI is 22 kg/m^2. Her blood pressure is 110/70 mm Hg. Examination shows no axillary lymphadenopathy. The breasts are symmetric, and there are no skin changes. Examination of the right breast shows a 2-cm, well-defined, mobile, nontender mass in the upper inner quadrant; there are no masses in the left breast. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Follow-up examination in 6 months
B) Mammography of the right breast
C) Ultrasonography of the right breast
D) Core-needle biopsy of the mass
E) Excisional biopsy of the mass

Correct Answer: C.

Fibroadenomas are benign tumors of the breast that are composed of stromal and epithelial tissue, and which present in young women, typically in the third to fourth decade of life. Fibroadenomas are usually unilateral, nontender, mobile, and have a rubbery consistency. Fibroadenomas display hormonal sensitivity and as a result may enlarge during pregnancy. Ultrasonography is the most appropriate initial diagnostic test and may show typical findings of a well-circumscribed mass with uniform hypoechogenecity. Suspected fibroadenomas that display atypical ultrasonographic features, such as a size greater than 2.5 cm or progressive enlargement, should be further examined with ultrasound-guided core-needle biopsy. The majority of fibroadenomas may be safely observed.

Incorrect Answers: A, B, D, and E.

Follow-up examination in 6 months (Choice A) is appropriate, but ultrasonography should be performed first to exclude the possibility of malignancy.

Mammography of the right breast (Choice B) is useful for the evaluation of fibroadenomas but exposes the patient to radiation and is not preferable in patients younger than 30 years of age.

Core-needle biopsy of the mass (Choice D) or excisional biopsy of the mass (Choice E) is not usually necessary. Fibroadenomas have minimal malignant potential and a biopsy does not need to be performed unless they display progressive enlargement or atypical features. If a biopsy is performed, core-needle biopsy is preferable to excisional biopsy given its minimal invasiveness and preferable cosmetic outcomes.

Educational Objective: Fibroadenomas are benign tumors of the breast that are composed of stromal and epithelial tissue, and which present in young women, typically in the third to fourth decade of life. Ultrasonography is the best initial diagnostic test and typically shows a well-circumscribed mass with uniform hypoechogenecity.

45. A previously healthy 18-year-old man is brought to the emergency department because of nausea, vomiting, and abdominal pain for 24 hours. He has had a 4.5-kg (10-lb) weight loss over the past month despite no change in appetite. He has not had fever, chills, or diarrhea and has not traveled recently. He is lethargic but arousable and oriented. His pulse is 118/min, respirations are 16/min, and blood pressure is 98/58 mm Hg. Examination shows dry mucous membranes. Abdominal examination shows right upper quadrant tenderness with no guarding. Neurologic examination shows no focal findings. Laboratory studies show:

Hemoglobin	16.3 g/dL
Leukocyte count	12,000/mm^3
Serum	
Na^+	135 mEq/L
Cl^-	101 mEq/L
K^+	4.4 mEq/L
HCO_3^-	14 mEq/L
Urea nitrogen	48 mg/dL
Glucose	250 mg/dL
Creatinine	2.3 mg/dL

Arterial blood gas analysis on room air:

pH	7.32
Pco_2	30 mm Hg
Po_2	105 mm Hg

Which of the following is the most likely diagnosis?

A) Ethylene glycol ingestion
B) Diabetes insipidus
C) Diabetic ketoacidosis
D) Hyperosmolar coma
E) Hypoaldosteronism
F) Inappropriate secretion of ADH (vasopressin)
G) Methanol ingestion

Correct Answer: C.

Hyperglycemia and anion-gap metabolic acidosis in a young, previously healthy patient presenting with weight loss and signs of volume depletion are most consistent with a diagnosis of diabetic ketoacidosis (DKA), likely a declaring presentation of insulin-dependent diabetes mellitus in this case. Insulin-dependent, type 1 diabetes mellitus generally presents within the first or second decade of life and occurs as a result of autoimmune destruction of pancreatic beta islet cells, resulting in failure of the native pancreas to synthesize insulin. Insulin deficiency results in weight loss caused by the absence of the anabolic effects of insulin, and hyperglycemia as a result of the loss of insertion of insulin-dependent GLUT channels into cell membranes. The consequent net catabolism results in gluconeogenesis, glycogen degradation, lipolysis, and ketogenesis. Ketogenesis results in the accumulation of ketoacids such as beta-hydroxybutyrate and acetoacetate, which are responsible for the metabolic acidosis of DKA. Hyperglycemia promotes osmotic diuresis which may cause hypovolemic shock, reflected by this patient's tachycardia, borderline hypotension, and dry mucous membranes on examination. While a ketone assay is required to confirm the diagnosis, the presence of hyperglycemia, low bicarbonate, and anion-gap metabolic acidosis makes competing diagnoses less likely. This patient will require treatment with intravenous fluid repletion, careful monitoring of electrolytes (especially potassium), insulin replacement, and a search for a precipitating cause (eg, infection).

Incorrect Answers: A, B, D, E, F, and G.

Ethylene glycol ingestion (Choice A) and methanol ingestion (Choice G) present with anion gap metabolic acidosis. Ethylene glycol is metabolized to oxalic acid and may result in end-stage kidney disease, as in this case, but would not be expected to cause 1 month's worth of preceding weight loss, or hyperglycemia, nor would methanol ingestion. Methanol is metabolized to formaldehyde and formic acid; blindness and visual disturbances can result from the ingestion of methanol. Additionally, an osmolar gap may be present between calculated and measured serum osmolality in cases of toxic alcohol ingestion.

Diabetes insipidus (Choice B) reflects an inability of the kidney to concentrate urine and may have central or nephrogenic causes depending on whether insufficient antidiuretic hormone (ADH) is produced, or whether the response to ADH by the kidney is insufficient. It does not present with anion-gap acidosis.

Hyperosmolar coma (Choice D) results from severe hyperglycemia, associated hyperosmolality, and severe volume depletion, most often occurring in a patient with non-insulin-dependent diabetes mellitus. Abnormal ketone production does not occur in the setting of hyperosmolar coma. Anion-gap acidosis in this case makes DKA a more likely diagnosis.

Hypoaldosteronism (Choice E) presents with non-anion-gap metabolic acidosis and hyperkalemia, neither of which are seen in this case. Aldosterone promotes the kidney excretion of potassium and hydrogen ions, along with uptake of sodium.

Inappropriate secretion of ADH (vasopressin) (Choice F) presents with euvolemic hypo-osmolar hyponatremia. This patient's sodium concentration is within normal range.

Educational Objective: Diabetic ketoacidosis presents with hyperglycemia, anion-gap metabolic acidosis, and the presence of ketoacids on laboratory assay. It results from insufficient insulin signaling leading to dysregulated and excess cellular catabolism and ketogenesis. Treatment involves intravenous fluid repletion, electrolyte correction, insulin replacement, and management of precipitating conditions.

46. A 42 -year-old woman comes to the physician because of a nontender lump on the right side of her neck that she discovered 1 month ago. She has no history of serious illness and does not smoke. Her temperature is 37°C (98.6°F), pulse is 72/min, respirations are 14/min, and blood pressure is 122/80 mm Hg. Examination shows a 2-cm mass in the right pretracheal area; the mass moves when the patient swallows. There is no lymphadenopathy. Which of the following studies is most likely to establish a diagnosis?

A) Thyroid function tests
B) CT scan of the neck
C) ^{131}I scintigraphy
D) Direct laryngoscopy
E) Fine-needle aspiration biopsy

Correct Answer: E.

The differential diagnosis for a chronic, nontender, otherwise asymptomatic neck mass can be refined based on the location and the characteristics of the mass itself. In this case, a nontender mass located on the right side of the neck in the pretracheal area that elevates with swallowing likely represents a thyroid nodule. While thyroid nodules may be benign areas of hyperplastic overgrowth, malignancy (eg, papillary thyroid carcinoma) must be ruled out. Such masses may also be cystic, infectious, or inflammatory in nature, though neoplasia is the more likely cause. The absence of lymphadenopathy in this case argues against both infectious causes and dissemination of any neoplastic cause. Fine-needle aspiration (FNA) biopsy is the best next step, which allows easy sampling of the lesion for evaluation of cells and stroma. The thyroid is a vascular gland, and excisional biopsy is often complicated by bleeding; invasive surgical procedures should be deferred until results of FNA dictate such need.

Incorrect Answers: A, B, C, and D.

Thyroid function tests (Choice A) and ^{131}I scintigraphy (Choice C) may be appropriate in the evaluation of patients with thyroid nodules and symptoms of hyperthyroidism, such as weight loss, heat intolerance, warm, flushed skin, nausea, diarrhea, amenorrhea, tachycardia, or palpitations. These tests may show evidence of a hyperfunctioning thyroid or increased iodine uptake within a nodule, nodules, or diffusely in the gland depending on the cause. This patient demonstrates no symptoms of thyroid dysfunction.

CT scan of the neck (Choice B) is appropriate to evaluate the structural character and spread of a neck mass, and in practice, may be ordered prior to biopsy for approach planning and to exclude competing diagnoses, however it is unlikely to disclose the actual diagnosis. Such precision requires histopathological evaluation with biopsy.

Direct laryngoscopy (Choice D) permits visualization of the epiglottis, arytenoids, and vocal folds; if a vocal cord or laryngeal nodule were suspected, this study would be indicated, however a palpable mass at the anterior neck is anatomically located superficial to the larynx.

Educational Objective: Thyroid nodules may be inflammatory, infectious, cystic, or neoplastic, with malignancy representing an important diagnosis to be excluded. Definitive diagnosis of a thyroid nodule requires histopathologic evaluation, which is best accomplished by FNA biopsy.

47. An asymptomatic 57-year-old woman comes to the physician for a routine health maintenance examination. She has smoked one pack of cigarettes daily for 40 years. She drinks wine occasionally at social events. She takes vitamin D daily. Examination shows no abnormalities. Laboratory studies show:

Hematocrit	42%
Serum	
Ca^{2+}	11.5 mg/dL
Urea nitrogen	15 mg/dL
Creatinine	1 mg/dL
Phosphorus	2.8 mg/dL
Parathyroid hormone, intact	12 pg/mL (N=10–65)
Parathyroid hormone-related protein	12 pmol/L (N<1.3)

An x-ray of the chest shows a 2-cm nodule in the right upper lobe of the lung. Which of the following is the most likely diagnosis?

A) Metastatic carcinoma of the colon
B) Primary hyperparathyroidism
C) Sarcoidosis
D) Small cell carcinoma of the lung
E) Squamous cell carcinoma of the lung

Correct Answer: E.

Squamous cell carcinoma of the lung is the second most common type of primary lung cancer after adenocarcinoma. Risk factors for all major types of lung cancer include tobacco use, secondhand smoke, asbestos or radon exposure, and a family history of lung cancer. Features associated with squamous cell carcinoma of the lung include pulmonary cavitation, central location, and hypercalcemia caused by paraneoplastic parathyroid hormone-related peptide (PTHrP) production. Histologic characteristics include polygonal cells with intercellular bridges, eosinophilic cytoplasm, keratin pearls, and extensive necrosis. Lung cancer in general typically presents with cough, unintentional weight loss, hemoptysis, chest pain, dyspnea, and hoarseness; occasionally, wheezing, focal rhonchi or hypertrophic osteoarthropathy may be noted on examination. Diagnosis is made by chest imaging and examination of a biopsy specimen. Prognosis is a function of the cancer type along with grading and staging of the disease. It is often detected once metastatic, at which point the prognosis is poor.

Incorrect Answers: A, B, C, and D.

Metastatic carcinoma of the colon (Choice A) most commonly presents with a change in bowel habits, rectal bleeding, and weight loss. It commonly metastasizes to the liver, lung, and peritoneum. Metastatic lesions in the lung typically appear as randomly distributed pulmonary nodules. Colorectal cancer is not associated with PTHrP production or hypercalcemia.

Primary hyperparathyroidism (Choice B) is most commonly caused by a parathyroid adenoma, followed by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of parathyroid hormone (PTH) results in hypercalcemia. An increased serum intact PTH concentration and an undetectable PTHrP concentration would be expected.

Sarcoidosis (Choice C) is a non-caseating granulomatous disease that often involves the lung, and classically presents with shortness of breath and cough. Hypercalcemia is associated with unregulated vitamin D synthesis. Characteristic imaging findings include bilateral hilar lymphadenopathy, with or without bilateral upper lobe predominant interstitial infiltrates. The patient's history of tobacco use, increased PTHrP concentration, and a solitary lung nodule on x-ray are more suggestive of primary lung cancer.

Small cell carcinoma of the lung (Choice D) is a neoplasm of neuroendocrine cells and is associated with numerous paraneoplastic syndromes, including Cushing syndrome, syndrome of inappropriate antidiuretic hormone, Lambert-Eaton myasthenic syndrome caused by presynaptic calcium channel antibody production, paraneoplastic limbic encephalitis, and subacute cerebellar degeneration. Hypercalcemia and PTHrP production are associated with squamous cell lung cancer.

Educational Objective: Centrally located primary lung cancers include squamous cell carcinoma of the lung and small cell carcinoma of the lung. Squamous cell carcinoma is the more common subtype and is associated with hypercalcemia caused by PTHrP production.

48. A hospitalized 22-year-old woman with acute myelogenous leukemia undergoes evaluation prior to discharge. She has received induction chemotherapy and transfusions via a subcutaneous central venous catheter for the past 4 weeks. Two days ago, results of a complete blood count and bone marrow biopsy showed no abnormalities. Examination shows well-healed skin over the catheter. The remainder of the examination shows no abnormalities. The physician reviews the patient's discharge plan with her and her parents. Which of the following is the most appropriate recommendation to avoid complications related to the catheter?

A) Avoiding bathing in a shower or bathtub

B) Hand washing with an antibacterial soap prior to contact with the catheter

C) Placement of a new sterile dressing at the site of access

D) Topical application of mupirocin at the site of access

E) Oral penicillin therapy

Correct Answer: B.

The primary goals of central venous catheter maintenance are to prevent catheter-related infection, thrombotic complications, and mechanical dislodgement. Infection risk is reduced by minimizing the amount of time the catheter is accessed and exposed, routinely inspecting the catheter site, periodically changing the catheter dressing, and using aseptic technique when manipulating the catheter. Hand washing with an antibacterial soap prior to contact with the catheter is an essential step in practicing aseptic technique and reducing the risk of infectious complications. Thrombotic complications can be reduced by using catheter lock solutions, routinely inspecting the catheter site, and timely initiation of anticoagulation or catheter exchange if thrombus does develop. Mechanical dislodgement can be addressed by securing the catheter with sutures, covering it with a dressing when not in use, routinely inspecting the catheter site, and avoiding sudden, large movements while handling the catheter.

Incorrect Answers: A, C, D, and E.

Avoiding bathing in a shower or bathtub (Choice A) is not necessary for routine maintenance of a central venous catheter, though care should be taken to keep the catheter site and dressing dry. Waterproof covers can be used, and the catheter should be cleaned, and the dressing changed if it does become damp, loosened, or visibly soiled.

Placement of a new sterile dressing at the site of access (Choice C) is recommended weekly for central venous catheters to reduce the risk of infection. Hand washing prior to manipulating the catheter will have a greater effect on reducing infectious complications.

Topical application of mupirocin at the site of access (Choice D) and oral penicillin therapy (Choice E), as well as other agents for local or systemic antimicrobial prophylaxis, are not necessary for routine maintenance of central venous catheters. Patients with limited venous access options who have a known line infection or are at high-risk for line infections and cannot have the catheter replaced may be managed with prophylactic or suppressive antibiotics under the guidance of an infectious disease expert.

Educational Objective: Central venous catheters, especially when present for extended durations outside of the hospital, are at risk for infectious, thrombotic, and mechanical complications. Hand washing and appropriate aseptic technique prior to manipulating the catheter and routine catheter site inspection are essential for minimizing the risk of complications.

49. A 57-year-old man is brought to the emergency department by his wife because of a 3-hour history of progressive lethargy. He has a 5-year history of myasthenia gravis; thymectomy did not improve his symptoms. He has smoked one pack of cigarettes daily for 30 years and drinks one glass of wine daily. Current medications include prednisone and azathioprine. On arrival, he is lethargic and difficult to arouse. Examination shows marked bilateral ptosis. Breath sounds are slightly decreased with no wheezes or crackles. Arterial blood gas analysis on room air shows:

pH	7.19
Pco_2	70 mm Hg
Po_2	70 mm Hg
HCO_3^-	25 mEq/L

Which of the following is the most likely acid-base disorder?

A) Acute respiratory failure only
B) Chronic respiratory failure only
C) Chronic respiratory failure with an acute exacerbation
D) Metabolic acidosis
E) Metabolic alkalosis

Correct Answer: A.

This patient with myasthenia gravis and a prolonged smoking history is likely experiencing acute respiratory failure on both the basis of the clinical history and the analysis of his blood gases. Myasthenia gravis is an autoimmune condition in which antibodies result in destruction of acetylcholine (or MuSK) receptors at the neuromuscular junction. Fewer receptors at the junction limits cholinergic signal transmission, which is vital for muscle contraction. This is true of all skeletal muscle, including the intercostal muscles and diaphragm. In addition to classic symptoms such as progressive muscle weakness and ptosis, patients may experience myasthenic respiratory crises, especially in settings of increased respiratory demand (eg, obstructive lung disease, infection, sepsis, sympathetic stimulus). When patients are unable to ventilate because of impaired chest wall mechanics, acute retention of carbon dioxide results, which can cause an acute (potentially acute on chronic) respiratory acidosis as seen in this patient. Additionally, ventilation-perfusion mismatch can result in hypoxemia, also seen in this patient. Analysis of the blood gas disclose that the acidosis is acute and respiratory. Acidosis is determined on the basis of the pH being less than 7.4, and the increased carbon dioxide indicates that a respiratory cause is present. In acute respiratory acidosis, the pH falls by approximately 0.08 mm Hg for every increase in Pco_2 by 10 mm Hg. In this example, the Pco_2 is 30 mm Hg above normal, which indicates that the pH should fall by 3* 0.08 mm Hg = 0.24 mm Hg below 7.4. This patient's pH in an acute respiratory acidosis should be approximately 7.16 which is approximately his value (7.19). Values that do not coincide with approximate computations based on known compensation should prompt investigation for a second or third metabolic or respiratory acid-base derangement. In this case, it may be reasonable to suspect a small metabolic acidosis caused by hypoxia driving lactate production in addition to the respiratory acidosis, however this is not demonstrated by the data. CO_2 retention is a classic cause of depressed mental status in respiratory failure, known as CO_2 narcosis. Treatment includes mechanical ventilatory support (eg, bilevel positive airway pressure, intubation with mechanical ventilation) and cholinergic medications (eg, pyridostigmine).

Incorrect Answers: B, C, D, and E.

Chronic respiratory failure only (Choice B) is incorrect. In chronic respiratory failure, the pH falls by approximately 0.03 mm Hg for every increase in Pco_2 by 10 mm Hg. In this example, the Pco_2 is 30 mm Hg above normal, which indicates that the pH should fall by 3* 0.03 mm Hg = 0.09 mm Hg below 7.4. This patient's pH is 7.19; if his respiratory failure were chronic, it should be closer to 7.31. This is caused by kidney compensation for chronic CO_2 retention. Similarly, in chronic respiratory failure with an acute exacerbation (Choice C), pH generally falls by an amount between 0.3-0.8 mm Hg for each 10 mm Hg increase in Pco_2. Further, patients with chronic respiratory failure retain CO_2 as bicarbonate; this patient's bicarbonate concentration is nearly normal even in exacerbation, which argues against any chronic or acute on chronic component of disease.

Metabolic acidosis (Choice D) is incorrect, as bicarbonate and Pco_2 both decrease in metabolic acidosis outside of multiple derangements.

Metabolic alkalosis (Choice E) is incorrect as this patient is acidotic (pH is less than 7.35-7.45), not alkalotic.

Educational Objective: In acute respiratory acidosis, the pH falls by approximately 0.08 mm Hg for every increase in Pco_2 by 10 mm Hg. Acute respiratory acidosis is a common complication of hypoventilation, as seen in cases of myasthenic respiratory crisis.

50. A previously healthy 24-year-old woman is brought to the emergency department because of severe abdominal pain for 4 hours. The pain began after she ate lunch following an aerobics class. She is not sexually active. Her temperature is 38.2°C (100.8°F), and pulse is 120/min. Abdominal examination shows left lower quadrant tenderness and rebound to deep palpation. Pelvic examination shows an exquisitely tender left ovary; the introitus is normal. There is no discharge in the vaginal vault and no cervical motion tenderness. Her leukocyte count is 15,300/mm^3 (80% segmented neutrophils, 2% eosinophils, 15% lymphocytes, and 3% monocytes). Urinalysis is within normal limits. In addition to measurement of serum β-hCG concentration, which of the following is the most appropriate next step in diagnosis?

A) X-ray of the abdomen
B) Hysterosalpingography
C) Transvaginal ultrasonography
D) CT scan of the abdomen
E) Culdocentesis

Correct Answer: C.

Severe, acute abdominopelvic pain in a woman of childbearing age with a focally tender ovary should raise suspicion for ovarian torsion, ruptured ectopic pregnancy, pelvic inflammatory disease, and ruptured ovarian cyst, in addition to emergency gastrointestinal, vascular, and urological differential diagnoses. Female pelvic anatomy is best imaged for these purposes with pelvic transvaginal ultrasonography, which provides excellent resolution images of the ovaries, fallopian tubes, uterus, bladder, and pouch of Douglas, while also permitting Doppler analysis of vascular flow, which is crucial when ovarian torsion is a suspected diagnosis. Ovarian torsion results when the ovary twists about itself within the broad ligament, which results in constriction and impingement of the venous and arterial supply. Edema, ischemia, and infarction can result if the torsion is not promptly surgically reduced. Ultrasonographic signs of ovarian torsion include reduced or absent Doppler flow in the uterine or gonadal arterial supply, an absence or reduction of vascular flow within the ovarian stroma, ovarian edema, hypoechoic fluid surrounding the ovary, and ovarian follicles displaced to the outside of the organ. A large ovarian cyst (> 5 cm) may suggest a cause of torsion. Treatment includes pain control plus surgical reduction of torsion. In this example, additional differential diagnoses to consider include pelvic inflammatory disease and tuboovarian abscess on the basis of the patient's fever and leukocytosis (though these are less likely given an absence of sexual activity and inconsistent examination) and ruptured ectopic pregnancy or ovarian cyst. Any of these differential diagnoses are appropriately evaluated on ultrasonography, making it the most appropriate next step.

Incorrect Answers: A, B, D, and E.

X-ray of the abdomen (Choice A) may be useful in evaluating bowel gas pattern, obstruction, malrotation, volvulus, perforation, or nephrolithiasis among other diagnoses. It does not provide sufficient soft tissue imaging when evaluating the pelvis, and pelvic organs are generally obscured by the surrounding bony pelvis.

Hysterosalpingography (Choice B) is used to evaluate the lumen of the uterus and fallopian tubes. It may be useful in assessing for polyps, synechiae or adhesions, malignancies, or strictures, and is often employed in the evaluation of malignancy or infertility. It would not reasonably evaluate an ovary.

CT scan of the abdomen (Choice D) is a reasonable choice to evaluate the abdominal and pelvic organs, however it does not permit direct assessment of vascular flow to an ovary. Only indirect signs of ovarian torsion would be present, such as displaced follicles, the presence of cysts or tumors (nidi of torsion), and ovarian edema. CT scan is a reasonable choice when the differential is less focused on ovarian pathology (eg, if nephrolithiasis or diverticulitis was as likely).

Culdocentesis (Choice E) is a generally outdated technique to sample fluid from the pouch of Douglas via a transvaginal approach. Given the availability of rapid and advanced imaging techniques such as CT scan and ultrasonography, its use has largely been relegated to settings where these modalities are not as available.

Educational Objective: Ultrasonography is an excellent imaging modality for evaluating female pelvic anatomy as it permits both structural and vascular anatomic and functional assessment. It is the study of choice when ovarian, tubal, or uterine pathology is high on the differential.

1. An otherwise healthy 11-year-old girl is brought to the physician by her mother because of a 3-month history of right breast tenderness. She is at the 50th percentile for height and weight. Breast development is Tanner stage 1 on the left and Tanner stage 2 on the right. The left breast is flat and nontender, and the right breast is slightly raised, enlarged, and tender; there is no nipple discharge. There is no axillary or pubic hair. Pelvic examination shows normal-appearing external genitalia. Which of the following is the most appropriate next step in management?

A) Reassurance
B) Measurement of serum prolactin concentration
C) Ultrasonography of the pelvis
D) CT scan of the pituitary fossa
E) Biopsy of the breast

Correct Answer: A.

Reassurance is appropriate for this young girl who has just begun thelarche (breast development). Puberty in girls typically follows a predictable course of thelarche to pubarche (pubic hair) to a growth spurt and, finally, menarche. Mild unilateral or bilateral breast swelling can be normal in early puberty because of the increased production of estrogen and the growth of mammary tissue. There may be asymmetry in development of the breast tissue. Thus, this patient and her mother can be reassured that this is likely a normal finding of the initial stage of puberty rather than a sign of pathology. However, the patient should be examined again in 6 months to ensure that no concerning features have developed.

Incorrect Answers: B, C, D, and E.

Measurement of serum prolactin concentration (Choice B) is useful when hyperprolactinemia is suspected. In a premenopausal woman, hyperprolactinemia causes amenorrhea or galactorrhea. This patient's unilateral breast swelling is more consistent with normal thelarche.

Ultrasonography of the pelvis (Choice C) is used to evaluate ovarian and uterine pathology. In this case, the patient's asymmetrical breast swelling is not a result of any ovarian or uterine cause but is a feature of normal thelarche. Pelvic ultrasonography is not necessary at this time.

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C) Ultrasonography of the pelvis

D) CT scan of the pituitary fossa

E) Biopsy of the breast

Correct Answer: A.

Reassurance is appropriate for this young girl who has just begun thelarche (breast development). Puberty in girls typically follows a predictable course of thelarche to pubarche (pubic hair) to a growth spurt and, finally, menarche. Mild unilateral or bilateral breast swelling can be normal in early puberty because of the increased production of estrogen and the growth of mammary tissue. There may be asymmetry in development of the breast tissue. Thus, this patient and her mother can be reassured that this is likely a normal finding of the initial stage of puberty rather than a sign of pathology. However, the patient should be examined again in 6 months to ensure that no concerning features have developed.

Incorrect Answers: B, C, D, and E.

Measurement of serum prolactin concentration (Choice B) is useful when hyperprolactinemia is suspected. In a premenopausal woman, hyperprolactinemia causes amenorrhea or galactorrhea. This patient's unilateral breast swelling is more consistent with normal thelarche.

Ultrasonography of the pelvis (Choice C) is used to evaluate ovarian and uterine pathology. In this case, the patient's asymmetrical breast swelling is not a result of any ovarian or uterine cause but is a feature of normal thelarche. Pelvic ultrasonography is not necessary at this time.

CT scan of the pituitary fossa (Choice D) is used to evaluate a pituitary tumor. Since this patient's findings are consistent with thelarche, there is no need to perform imaging studies. Reassurance is a more appropriate course of action.

Biopsy of the breast (Choice E) is not necessary in this case. This is an invasive procedure with the potential for cosmetic disfigurement of the breast and should be reserved for breast masses with a suspected pathologic diagnosis.

Educational Objective: In girls, puberty follows a predictable course of thelarche, pubarche, a growth spurt, and menarche. During thelarche, enlargement of the breast tissue occurs, which can sometimes initially present as a subareolar mass or may be asymmetric.

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2. A 13-year-old girl is brought to the physician by her mother because of a 10-day history of vaginal spotting. This is her first episode of vaginal bleeding. She has never been sexually active. She has mild asthma treated with an inhaled β-adrenergic agonist as needed. She is at the 75th percentile for height and 80th percentile for weight and BMI. Breast and pubic hair development are Tanner stage 4. The external genitalia are normal. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Follow-up examination in 6 months
B) Measurement of serum follicle-stimulating hormone concentration
C) Vaginal ultrasonography
D) CT scan of the head
E) Oral contraceptive therapy

Correct Answer: A.

Follow-up examination in 6 months is appropriate for this young girl who has just begun menarche (development of menses). Puberty in girls typically follows a predictable course of thelarche (breast development) to pubarche (pubic hair) to a growth spurt and, finally, menarche. The first menstrual period is related to estradiol stimulation of the endometrial lining rather than ovulation and may be accompanied by prolonged vaginal spotting. There is considerable variability between girls during the first few years after menarche. In nearly two-thirds of girls, regular ovulatory cycles do not take place for over a year after menarche. With maturation, increasingly regular menstrual periods result from ovulation and last an average of 28 days. However, intermittent anovulatory cycles may continue to cause abnormal uterine bleeding through adolescence. The patient should be examined again in 6 months to ensure that her menstrual cycles are becoming more regular and to begin establishing a healthy physician-patient relationship with an adolescent patient.

Incorrect Answers: B, C, D, and E.

Measurement of serum follicle-stimulating hormone (FSH) concentration (Choice B) is useful when evaluating the underlying cause of amenorrhea, or lack of menses. However, this patient's concern is excessive vaginal spotting.

Vaginal ultrasonography (Choice C) is used to evaluate for structural pathology involving the ovaries, uterus, or vagina that may delay or impact menarche. In this case

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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Measurement of serum follicle-stimulating hormone (FSH) concentration (Choice B) is useful when evaluating the underlying cause of amenorrhea, or lack of menses. However, this patient's concern is excessive vaginal spotting.

Vaginal ultrasonography (Choice C) is used to evaluate for structural pathology involving the ovaries, uterus, or vagina that may delay or impact menarche. In this case, the patient's vaginal spotting is not caused by a structural abnormality but rather stimulation of the endometrial lining, which is typical of menarche.

CT scan of the head (Choice D) is used to evaluate for an intracranial cause of abnormal uterine bleeding such as a pituitary tumor. Since this patient's findings are typical of menarche, there is no need to perform imaging studies. Reassurance is a more appropriate course of action.

Oral contraceptive therapy (Choice E) may be used to regulate ovulation in adolescent patients. It is appropriate for use in patients whose abnormal uterine bleeding negatively impacts quality of life or in patients who are sexually active as a form of contraceptive. However, this patient's vaginal spotting is likely to resolve with increasing pubertal maturity without a need for oral contraceptive therapy.

Educational Objective: In girls, puberty follows a predictable course of thelarche, pubarche, a growth spurt, and menarche. The first menstrual period is related to estradiol stimulation of the endometrial lining rather than ovulation and may be accompanied by prolonged vaginal spotting. The years following menarche are highly variable among girls, and abnormal uterine bleeding often occurs secondary to anovulatory cycles.

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3. A 7-month-old boy is brought to the physician because of a 4-day history of persistent fever. He was born at term following an uncomplicated pregnancy and delivery; there was prolonged bleeding following circumcision. At the age of 3 months, he developed eczema over the face and elbows that now involves the entire body. He has also had frequent episodes of thrush and otitis media and was recently discharged following treatment of pneumococcal bacteremia. His current temperature is 38.5°C (101.3°F), pulse is 120/min, and respirations are 32/min. Examination shows a diffuse eczematoid rash with areas of purulent drainage. Cervical lymph nodes are movable and range in size from 1.5 to 2 cm. There are white plaques over the oral cavity. The liver edge and spleen tip are palpated 2 cm below the costal margin. Laboratory studies show:

Hemoglobin	10 g/dL
Leukocyte count	5000/mm^3
Segmented neutrophils	60%
Lymphocytes	30%
Monocytes	10%
Platelet count	35,000/mm^3
Serum	
IgA	100 mg/dL
IgG	400 mg/dL
IgM	15 mg/dL
IgE	60 IU/mL

Which of the following is the most likely diagnosis?

A) Adenosine deaminase deficiency
B) Ataxia telangiectasia
C) HIV infection
D) Hyper-IgE syndrome
E) Thymic-parathyroid dysplasia (DiGeorge syndrome)

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IgM	15 mg/dL
IgE	60 IU/mL

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A) Adenosine deaminase deficiency
B) Ataxia telangiectasia
C) HIV infection
D) Hyper-IgE syndrome
E) Thymic-parathyroid dysplasia (DiGeorge syndrome)
F) Wiskott-Aldrich syndrome
G) X-linked agammaglobulinemia
H) X-linked lymphoproliferative disease
I) X-linked severe combined immunodeficiency

Correct Answer: F.

Wiskott-Aldrich syndrome is caused by a mutation in the WAS gene on the X chromosome that encodes a protein essential for actin cytoskeleton rearrangement that occurs during interactions between T lymphocytes, antigen-presenting cells, and B lymphocytes, leading to an impaired innate and adaptive immune system. The phenotype is variable but classically includes eczema, thrombocytopenia, and infections with encapsulated bacteria and opportunistic pathogens. Patients may present early with petechiae and bleeding from the umbilicus after separation. Patients are particularly susceptible to infections with *Streptococcus pneumoniae, Neisseria meningitidis*, and *Haemophilus influenzae*, but they are also susceptible to a variety of opportunistic pathogens. In addition to recurrent infections, patients are also at an increased risk for autoimmune disease and malignancy, particularly leukemia.

Incorrect Answers: A, B, C, D, E, G, H, and I.

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Incorrect Answers: A, B, C, D, E, G, H, and I.

Adenosine deaminase deficiency (Choice A) results from autosomal recessive mutations in the ADA gene and is one of several mutations that can lead to the development of severe combined immunodeficiency disease (SCID). X-linked SCID (Choice I) is caused by mutations in the interleukin-2 receptor gamma chain. Both conditions present with recurrent viral, bacterial, and fungal infections starting at birth, failure to thrive, and severe lymphopenia with impaired cellular and humoral immunity.

Ataxia telangiectasia (Choice B) is an autosomal recessive disorder resulting from a DNA repair defect. Consequently, somatic mutations accumulate, leading to protein dysfunction and an increased susceptibility to hematologic malignancy such as Hodgkin lymphoma. Patients typically present with progressive ataxia, telangiectasias, abnormal eye movements, and decreased immunoglobulin concentrations (leading to recurrent sinopulmonary infections).

HIV infection (Choice C) is likely to occur in situations in which a mother with HIV did not receive antiretroviral therapy prior to or during pregnancy, or in instances when the HIV viral load is detectable. Most patients do not develop clinical manifestations of HIV infection in resourced settings since diagnosis is made quickly and patients are started on antiretroviral therapy.

Hyper-IgE syndrome (Choice D) results from a defect in the JAK-STAT signaling pathway that leads to impaired Th17 cell differentiation. Patients present with eczema and cutaneous cold abscesses.

DiGeorge syndrome (Choice E) is caused by a 22q11 deletion that leads to failure of the third and fourth branchial pouches to develop. These structures give rise to the thymus and parathyroid glands, and their absence leads to thymic aplasia and hypocalcemia in the setting of cardiac and craniofacial defects. Patients are susceptible to

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X-linked agammaglobulinemia (Choice G) is caused by mutations in the BTK gene that encodes a tyrosine kinase essential for all stages of B lymphocyte development and proliferation. Patients present with recurrent infections and low or absent immunoglobulin concentrations.

X-linked lymphoproliferative disease (Choice H) results from a mutation in the signaling lymphocyte activation molecule-associated protein gene and leads to the development of lymphoma and/or fulminant mononucleosis.

Educational Objective: Wiskott-Aldrich syndrome is caused by a mutation in the WAS gene that leads to an immunodeficiency syndrome characterized by recurrent bacterial, fungal, and opportunistic infections in addition to eczema and thrombocytopenia.

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4. A 59-year-old woman with a 5-year history of ulcerative colitis comes to the office to discuss pharmacotherapy options. Her condition has been progressively less responsive to oral prednisone therapy. She also has Ehlers-Danlos syndrome and asthma. Other medications are mesalamine, albuterol, and tiotropium. The patient is allergic to sulfonamide drugs. She appears pale and has cushingoid facies; she is not in acute distress. Temperature is 36.9°C (98.4°F), pulse is 90/min, respirations are 16/min, and blood pressure is 110/60 mm Hg. Lungs are clear to auscultation. Cardiac examination discloses a grade 2/6 systolic ejection murmur heard best at the upper left sternal border; the murmur does not radiate. Abdomen is mildly distended and tender to palpation. There is 1+ edema of the lower extremities. Results of laboratory studies are shown:

Blood	
Hematocrit	36%
Hemoglobin	11.0 g/dL
WBC	13,000/mm^3
Neutrophils, segmented	60%
Eosinophils	1%
Lymphocytes	36%
Monocytes	2%
Basophils	1%
Platelet count	197,000/mm^3

The most appropriate pharmacotherapy for the patient is being considered. Which of the following is most appropriate for this patient to undergo before beginning this medication?

A) Chest x-ray
B) Dental examination
C) Echocardiography
D) Sulfonamide desensitization
E) Tuberculosis screening

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A) Chest x-ray
B) Dental examination
C) Echocardiography
D) Sulfonamide desensitization
E) Tuberculosis screening

Correct Answer: E.

Tuberculosis screening using either the serum interferon-gamma release assay (IGRA) or a subcutaneous purified protein derivative (PPD) test is the most appropriate next step prior to initiating therapy with an anti-tumor necrosis factor α (TNF-α) agent such as infliximab. This patient has ulcerative colitis that is refractory to steroids and mesalamine and has cushingoid features as a result of prolonged steroid use. Patients with high disease activity should be evaluated for treatment with a TNF-α inhibitor, but screening for latent *Mycobacterium tuberculosis* (MTB) infection should always be completed first since this class of medications increases the risk for reactivation. TNF-α is a cytokine secreted by macrophages, which supports granuloma formation. Granuloma formation is essential in the defense against MTB infection; monoclonal antibody therapy targeted against TNF-α increases a patient's risk for active mycobacterial infection because it stops the production of TNF-α, leading to breakdown of the granuloma and release of any contained organism. All patients who are considered for treatment with these agents must undergo screening for latent MTB infection. If positive, treatment for latent MTB with 9 months of isoniazid is indicated.

Incorrect Answers: A, B, C, and D.

Chest x-ray (Choice A) would be a required step in evaluation if this patient screened positive on her PPD or IGRA to evaluate for evidence of active pulmonary tuberculosis, but it is not necessary at this point.

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Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Chest x-ray (Choice A) would be a required step in evaluation if this patient screened positive on her PPD or IGRA to evaluate for evidence of active pulmonary tuberculosis, but it is not necessary at this point.

Dental examination (Choice B) is sometimes indicated for patients who require treatment with bisphosphonates since these agents increase the risk for osteonecrosis of the jaw, but a dental examination is not required prior to initiation of an anti-TNF-α agent.

Echocardiography (Choice C) is completed prior to initiation of chemotherapy agents such as anthracyclines that are known to be cardiotoxic, but echocardiography is not required prior to starting therapy with an anti-TNF-α agent.

Sulfonamide desensitization (Choice D) is sometimes necessary prior to solid organ transplantation so that patients can tolerate the use of trimethoprim-sulfamethoxazole, which is the first-line agent for prophylaxis against infection with *Pneumocystis jiroveci*.

Educational Objective: The use of monoclonal antibody therapy against TNF-α is associated with an increased risk for reactivated latent MTB secondary to inadequate granuloma maintenance. Because of this, all prospective candidates should be screened for latent MTB infection and treated if positive.

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5. A 27-year-old man with sickle cell disease is admitted to the hospital because of a 2-day history of increasingly severe pain in his shoulders, back, and shins. During the past 6 months, he has been hospitalized three times for treatment of painful crises unresponsive to outpatient therapy with hydrocodone. His temperature is 37.2°C (99°F), pulse is 90/min, respirations are 18/min, and blood pressure is 108/52 mm Hg. The lungs are clear to auscultation. Examination shows tenderness over the shoulders, back, and shins. His hematocrit is 30%, and reticulocyte count is 11%. In addition to pain control, which of the following is the most appropriate next step in management?

A) Bone scan
B) Antibiotic therapy
C) Intravenous administration of fluids
D) Blood transfusion
E) Plasmapheresis

Correct Answer: C.

Intravenous administration of fluids is the most appropriate next step in management of this patient with sickle cell disease and clinical presentation most consistent with an acute pain crisis. Patients with sickle cell crisis may develop pain secondary to vaso-occlusive events in nearly any part of the body. Pediatric patients tend to present with abdominal pain and dactylitis while older patients may develop diffuse pain in the arms and the legs. Treatment should focus on aggressive management of pain with the use of opiate and nonopiate medications and reversing any cause that may have triggered the pain crisis. The mainstay of therapy includes the administration of intravenous fluids to treat hypovolemia, in addition to judicious use of supplemental oxygen and aggressive control of pain. Most patients respond well to these conservative measures, although some may develop additional complications, such as acute chest syndrome, that require more aggressive treatment. Patients with frequent pain episodes should be considered for the use of hydroxyurea.

Incorrect Answers: A, B, D, and E.

Bone scan (Choice A) is used to evaluate for osteoblastic bony lesions such as malignancies or in the evaluation of metabolic bone disease (eg, Paget disease) among other pathologies. It does not have an immediate role in the evaluation of a sickle cell pain crisis.

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D) Blood transfusion

E) Plasmapheresis

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Bone scan (Choice A) is used to evaluate for osteoblastic bony lesions such as malignancies or in the evaluation of metabolic bone disease (eg, Paget disease) among other pathologies. It does not have an immediate role in the evaluation of a sickle cell pain crisis.

Antibiotic therapy (Choice B) is indicated for patients with sickle cell disease who have evidence of bacterial infection, which this patient does not have.

Blood transfusion (Choice D) is indicated for patients with severe sickle cell crises, evidence of end-organ damage, and anemia. This patient's hematocrit is likely at baseline and is not consistent with severe anemia.

Plasmapheresis (Choice E) is not used for the treatment of acute pain crises in patients with sickle cell disease but is commonly employed for treatment of hyperviscosity syndrome, thrombotic thrombocytopenic purpura, and sometimes pancreatitis secondary to hypertriglyceridemia.

Educational Objective: Patients with sickle cell disease may develop acute pain as a result of vaso-occlusive events, which may occur anywhere in the body. Treatment should focus on adequate pain management, maintenance of appropriate oxygenation, and treatment of hypovolemia.

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6. A 72-year-old man comes to the emergency department because he has vomited blood three times during the past 12 hours. He has had dizziness during this period. He has a 5-year history of arthritis treated with daily ibuprofen. Over the past 4 weeks, he has increased his daily dose of ibuprofen because of worsening joint pain but is not sure how many pills he has been taking. He has been unable to take his daily walks because of the joint pain. He has not had chest pain. He had an uncomplicated myocardial infarction 10 years ago. He appears pale. His temperature is 37.5°C (99.5°F), pulse is 110/min, respirations are 24/min, and blood pressure is 90/60 mm Hg. Examination shows dried blood near the mouth. The lungs are clear to auscultation. Heart sounds are normal. The stool is black, and test for occult blood is positive. His hematocrit is 22%, and platelet count is 215,000/mm^3. Upper endoscopy shows hemorrhagic gastritis with no active site of bleeding. Thirty minutes after fluid resuscitation with crystalloid solution and transfusion of 4 units of crossmatched packed red blood cells, the patient has shortness of breath. Diffuse rhonchi and crackles are heard bilaterally. Which of the following is the most likely cause of the dyspnea?

A) ABO incompatibility
B) Acute respiratory distress syndrome
C) Aspiration of gastric contents
D) Fluid overload
E) Pulmonary embolism

Correct Answer: D.

Fluid overload secondary to blood transfusions, also known as transfusion-associated cardiac overload (TACO), is one potential complication of large-volume blood transfusion in patients with underlying cardiac disease. It presents with signs and symptoms of respiratory distress from hypervolemia, including dyspnea from pulmonary edema, jugular venous distention, a widened pulse pressure, and hypertension. These symptoms frequently occur within hours of transfusion. The treatment includes halting further blood transfusions and minimizing the addition of other intravenous crystalloids or colloids, followed by diuresis with a loop diuretic. In severe instances, patients may require temporary support with invasive or noninvasive positive pressure ventilation. TACO is related to the volume of blood transfused and is not considered an immunologically mediated reaction. Therefore, patients may obtain further blood products in the future if necessary, but caution should be exercised as to the extent and the rapidity at which they are given.

Incorrect Answers: A, B, C, and E.

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Incorrect Answers: A, B, C, and E.

ABO incompatibility (Choice A) results in a severe hemolytic transfusion reaction with symptoms of intravascular hemolysis. Patients present within minutes of starting the blood transfusion with abdominal or flank pain, fever, and dark urine as a result of hemoglobinuria. This reaction is life-threatening, and patients must be managed aggressively.

Acute respiratory distress syndrome (ARDS) (Choice B) more commonly results from an inflammatory state within the alveoli that leads to dyspnea and hypoxemia. TACO is more likely to cause pulmonary edema, which can be treated with diuretics, than it is to cause ARDS.

Aspiration of gastric contents (Choice C) in the acute setting can lead to pneumonitis, with cough, wheezing, chest pain, and dyspnea as a result of exposure of the lungs to caustic gastric contents. It more commonly occurs in patients with a reduced level of consciousness or impaired neurologic reflexes. Aspiration pneumonitis may develop into aspiration pneumonia.

Pulmonary embolism (Choice E) can present with acute dyspnea, tachycardia, and chest pain, but the association of this patient's symptoms with the timing of blood transfusion and clinical evidence of hypervolemia make the diagnosis of TACO more likely.

Educational Objective: TACO refers to a state of hypervolemia that occurs as a result of transfusion of blood products in patients with underlying cardiac dysfunction and presents with dyspnea, jugular venous distention, tachycardia, and evidence of pulmonary edema. Treatment is with oxygen or positive pressure ventilation, if necessary, and with diuretic medications.

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7. Six hours after admission to the hospital for management of a seizure secondary to hyponatremia, a 53-year-old man with schizophrenia is found to have iron deficiency anemia. He says he has been drinking 1 gallon of water daily during the past 2 months. He is receiving haloperidol in the hospital. Physical examination shows no abnormalities. His fluid balance has normalized. His psychosis has improved, and he consents to colonoscopy, which shows a large tumor in the ascending colon. When the physician mentions cancer, the patient immediately says, "I don't have cancer; I stopped drinking a lot of water after I was admitted to the hospital." Which of the following is the most likely explanation for this patient's response?

A) Dementia
B) Denial
C) Rationalization
D) Reaction formation
E) Regression

Correct Answer: B.

When any person experiences painful thoughts, realities, or feelings such as anxiety or sadness, the mind has several unconscious psychological methods of shielding the person from conscious awareness of the thought, reality, or affect. These methods are called defense mechanisms. In denial, the mind protects itself from a painful external reality by unconsciously placing reality outside of awareness. This patient's mind has driven the painful reality that he has cancer out of his awareness, leading him to deny that he has cancer. Denial is considered an immature defense in that it preserves good feelings at the high cost of not recognizing the full scope of reality.

Incorrect Answers: A, C, D, and E.

Dementia (Choice A) refers to progressive cognitive impairment that occurs in old age. This patient demonstrates a clear understanding of the circumstances of his hospitalization, inconsistent with dementia, but is unable to accept the distressing news about his intestinal tumor. An absence of awareness about a specific, distressing piece of information is more consistent with denial than dementia.

Rationalization (Choice C) is a defense mechanism in which an individual justifies an unacceptable action or feeling using logic. For example, an individual might justify a

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C) Rationalization

D) Reaction formation

E) Regression

Correct Answer: B.

When any person experiences painful thoughts, realities, or feelings such as anxiety or sadness, the mind has several unconscious psychological methods of shielding the person from conscious awareness of the thought, reality, or affect. These methods are called defense mechanisms. In denial, the mind protects itself from a painful external reality by unconsciously placing reality outside of awareness. This patient's mind has driven the painful reality that he has cancer out of his awareness, leading him to deny that he has cancer. Denial is considered an immature defense in that it preserves good feelings at the high cost of not recognizing the full scope of reality.

Incorrect Answers: A, C, D, and E.

Dementia (Choice A) refers to progressive cognitive impairment that occurs in old age. This patient demonstrates a clear understanding of the circumstances of his hospitalization, inconsistent with dementia, but is unable to accept the distressing news about his intestinal tumor. An absence of awareness about a specific, distressing piece of information is more consistent with denial than dementia.

Rationalization (Choice C) is a defense mechanism in which an individual justifies an unacceptable action or feeling using logic. For example, an individual might justify a relationship breakup by believing that he didn't like his ex-partner that much anyway. This patient isn't justifying his cancer; he is in denial of it.

Reaction formation (Choice D) is a defense mechanism in which an unacceptable feeling is converted to its opposite. For example, an individual's intense anger toward their sister may instead manifest as feelings of love toward their sister marked by behaviors such as buying them extravagant gifts.

Regression (Choice E) is a defense mechanism that involves an individual returning to a prior stage of development as an unconscious response to intolerable distress. For example, a grown adult may hug a stuffed animal.

Educational Objective: Defense mechanisms protect a person from conscious awareness of painful emotions, thoughts, or realities. In denial, the mind protects itself from a painful external reality by unconsciously placing reality outside of awareness.

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8. A 25-year-old woman comes to the physician because of a 6-month history of itching over her arms that has become worse during the past 2 months. She attributes the itching to small worms, which she reports having seen appear from under her skin intermittently. On several occasions, she has "dug them out" with a clean needle. She has brought a small box containing samples of her dry skin and debris. She reports no history of depressed mood or auditory hallucinations. There is no personal or family history of serious illness. The patient takes no medications and does not use illicit drugs. Vital signs are within normal limits. Physical examination shows mildly inflamed lesions over the upper extremities with scabbing and excoriations. Examination of the samples she provides shows skin, scabs, and cotton fibers. On mental status examination, she has an anxious mood and constricted affect. Her speech is normal in rate and tone, and her thought processes are organized and coherent. She insists that she has parasites in her skin. Which of the following is the most likely diagnosis?

A) Bipolar disorder
B) Delusional disorder
C) Generalized anxiety disorder
D) Major depressive disorder with psychotic features
E) Schizophrenia

Correct Answer: B.

Delusional disorder is a psychotic disorder that features the presence of one or more delusions for a month or longer without other psychotic symptoms (eg, hallucinations, disorganized thinking, disorganized behaviors other than behaviors related to the delusion) or mood symptoms. Delusional parasitosis (as in this patient) and persecutory delusions are common types of delusions. Many patients, especially those with delusional parasitosis, will frequently present for care related to their perceived problem, generally receiving negative medical evaluations each time. Treatment typically includes antipsychotic medication and psychotherapy with the goal of improving the patient's coping with the delusion and gradually increasing insight into the delusion. The prognosis is guarded.

Incorrect Answers: A, C, D, and E.

Bipolar disorder (Choice A) is characterized by discrete episodes of depression and mania, which can sometimes be accompanied by psychotic symptoms such as hallucinations and delusions. This patient does not demonstrate episodic fluctuations in mood.

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D) Major depressive disorder with psychotic features

E) Schizophrenia

Correct Answer: B.

Delusional disorder is a psychotic disorder that features the presence of one or more delusions for a month or longer without other psychotic symptoms (eg, hallucinations, disorganized thinking, disorganized behaviors other than behaviors related to the delusion) or mood symptoms. Delusional parasitosis (as in this patient) and persecutory delusions are common types of delusions. Many patients, especially those with delusional parasitosis, will frequently present for care related to their perceived problem, generally receiving negative medical evaluations each time. Treatment typically includes antipsychotic medication and psychotherapy with the goal of improving the patient's coping with the delusion and gradually increasing insight into the delusion. The prognosis is guarded.

Incorrect Answers: A, C, D, and E.

Bipolar disorder (Choice A) is characterized by discrete episodes of depression and mania, which can sometimes be accompanied by psychotic symptoms such as hallucinations and delusions. This patient does not demonstrate episodic fluctuations in mood.

Generalized anxiety disorder (Choice C) is an anxiety disorder that presents with excessive and difficult to control worrying, hyperactivity, disordered sleep, fatigue, and trouble relaxing for at least 6 months. This patient's anxiety is specific to her delusional parasitosis.

Major depressive disorder with psychotic features (Choice D) includes 2 or more weeks of depressive symptoms and psychotic symptoms that occur concurrently. The psychotic symptoms are typically mood congruent (eg, delusions of guilt) and can be conceptualized as secondary to depression. This patient does not endorse depressive symptoms or related delusions of guilt.

Schizophrenia (Choice E) is a chronic psychotic disorder characterized by delusions, hallucinations, disorganized speech, disorganized behavior, and negative symptoms (eg, alogia, apathy, flattened affect). This patient's presentation does not include hallucinations, disorganized thinking, or disorganized behavior (other than behaviors related to her specific delusion).

Educational Objective: Delusional disorder is a psychotic disorder that features the presence of one or more delusions for a month or longer without other psychotic symptoms. Treatment commonly includes antipsychotic medication and psychotherapy.

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9. A 15-year-old boy is brought to the physician by his parents for an examination prior to participating on the school basketball team. Five weeks ago, he had a 1-week history of fever, sore throat, and diffuse muscle aches. Since then, he has had decreased energy and needs at least 10 hours of sleep every night. While the patient's parents are out of the room, the patient states that he does not want to play basketball, but his parents are forcing him to join the team. He is an honor student but failed an examination last week. He does not drink alcohol, but he smokes marijuana occasionally; he does not use any other illicit drugs. He has been sad and angry since his girlfriend broke up with him 3 weeks ago after she told him that he was "too moody and not fun to be around anymore." His pulse is 88/min, and blood pressure is 120/72 mm Hg. Physical examination shows no abnormalities. On mental status examination, he has a sad mood and a full range of affect. Which of the following is the most appropriate next step in management?

A) Reassurance
B) Assessment for suicide risk
C) Serologic testing for Epstein-Barr virus
D) Thyroid function tests
E) Urine toxicology screening

Correct Answer: B.

This patient with depressed mood, anhedonia (decreased enjoyment of basketball), hypersomnia, decreased energy, and decreased academic functioning likely possesses a diagnosis of major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, or appetite disturbance. These symptoms disrupt everyday functioning (eg, declining grades in school). The most effective treatment includes both psychotherapy and antidepressant medication. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation. If a patient endorses active suicidal ideation, then inpatient psychiatric hospitalization should be strongly considered. Suicide is one of the most significant potential consequences of MDD and should be actively addressed.

Incorrect Answers: A, C, D, and E.

Reassurance (Choice A) would be inappropriate in this patient who appears to meet MDD criteria and requires a thorough assessment for risk for self-harm.

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E) Urine toxicology screening

Correct Answer: B.

This patient with depressed mood, anhedonia (decreased enjoyment of basketball), hypersomnia, decreased energy, and decreased academic functioning likely possesses a diagnosis of major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, or appetite disturbance. These symptoms disrupt everyday functioning (eg, declining grades in school). The most effective treatment includes both psychotherapy and antidepressant medication. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation. If a patient endorses active suicidal ideation, then inpatient psychiatric hospitalization should be strongly considered. Suicide is one of the most significant potential consequences of MDD and should be actively addressed.

Incorrect Answers: A, C, D, and E.

Reassurance (Choice A) would be inappropriate in this patient who appears to meet MDD criteria and requires a thorough assessment for risk for self-harm.

Serologic testing for Epstein-Barr virus (EBV) (Choice C) may be appropriate if the patient continued to endorse physical symptoms consistent with EBV, since EBV has been associated with depression. However, this patient's depressive symptoms began more than 1 month after his EBV symptoms, which is inconsistent with depression secondary to a general medical condition such as EBV.

Thyroid function tests (Choice D) assist in diagnosing hypothyroidism as the cause of depressive symptoms. However, in addition to depression symptoms, patients with hypothyroidism typically demonstrate other physical examination findings (eg, dry skin, pretibial myxedema, coarse hair).

Urine toxicology screening (Choice E) is appropriate to exclude covert substance use as a contributor to depressive symptoms. However, the most urgent next step is to screen for suicidal ideation, the most acutely life-threatening sequela of depression.

Educational Objective: Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, or appetite disturbance. Prompt screening for suicidal ideation is necessary in patients with suspected or confirmed MDD.

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10. A 16-year-old boy is brought to the emergency department by his mother 30 minutes after a 4-minute episode of generalized shaking of his body. One hour ago, the patient's friend brought him home after a party, at which time, the patient exhibited unusual behavior and said he was a superhero with the ability to fly. The patient subsequently became unresponsive and the episode began. The friend reports that he saw the patient "smoke weed" at the party 2 hours before the episode. On arrival, the patient is diaphoretic and difficult to arouse. His temperature is 37.0°C (98.6°F), pulse is 120/min, respirations are 24/min, and blood pressure is 135/95 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. The pupils are 6 mm and sluggishly reactive to light. There is horizontal nystagmus. Use of which of the following substances is the most likely cause of this patient's symptoms?

A) Diazepam
B) Ethanol
C) Marijuana
D) Methamphetamine
E) PCP (phencyclidine)

Correct Answer: E.

Phencyclidine (PCP) is an illicit drug that acts on the central nervous system (CNS) in a variety of ways. It antagonizes *N*-methyl-D-aspartate receptors leading to excitatory neurotransmitter release, inhibits the reuptake of dopamine, norepinephrine, and serotonin, and stimulates α-adrenergic receptors. Acute PCP intoxication can lead to psychosis, bizarre behavior, agitation, aggression, nystagmus, and ataxia. Patients may be diaphoretic, tachycardic, and hypertensive as a result of sympathomimetic effects. Chronic PCP abuse can lead to depression, psychotic symptoms, memory loss, and dysarthria. Control of psychomotor agitation is the first step in management of patients with PCP intoxication for the safety of the patient and medical staff. Chemical sedation with benzodiazepines such as intramuscular lorazepam or midazolam can be administered to control symptoms. Once a patient is adequately sedated, further evaluation can be completed to assess for traumatic injuries or complications of PCP intoxication such as rhabdomyolysis, hyperthermia, and hypertension. In severe cases, PCP intoxication can cause seizures, encephalopathy, or a comatose state, which may necessitate emergent management, intubation, and supportive care.

Incorrect Answers: A, B, C, and D.

Diazepam (Choice A), a benzodiazepine, and ethanol (Choice B) are CNS depressants that, in toxic doses, can cause slurred speech, ataxia, emotional lability, and

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C) Marijuana

D) Methamphetamine

E) PCP (phencyclidine)

Correct Answer: E.

Phencyclidine (PCP) is an illicit drug that acts on the central nervous system (CNS) in a variety of ways. It antagonizes *N*-methyl-D-aspartate receptors leading to excitatory neurotransmitter release, inhibits the reuptake of dopamine, norepinephrine, and serotonin, and stimulates α-adrenergic receptors. Acute PCP intoxication can lead to psychosis, bizarre behavior, agitation, aggression, nystagmus, and ataxia. Patients may be diaphoretic, tachycardic, and hypertensive as a result of sympathomimetic effects. Chronic PCP abuse can lead to depression, psychotic symptoms, memory loss, and dysarthria. Control of psychomotor agitation is the first step in management of patients with PCP intoxication for the safety of the patient and medical staff. Chemical sedation with benzodiazepines such as intramuscular lorazepam or midazolam can be administered to control symptoms. Once a patient is adequately sedated, further evaluation can be completed to assess for traumatic injuries or complications of PCP intoxication such as rhabdomyolysis, hyperthermia, and hypertension. In severe cases, PCP intoxication can cause seizures, encephalopathy, or a comatose state, which may necessitate emergent management, intubation, and supportive care.

Incorrect Answers: A, B, C, and D.

Diazepam (Choice A), a benzodiazepine, and ethanol (Choice B) are CNS depressants that, in toxic doses, can cause slurred speech, ataxia, emotional lability, and memory lapses.

Marijuana (Choice C) is a hallucinogen that causes euphoria, paranoia, hallucinations, cognitive slowing, conjunctival injection, and dilated pupils.

Methamphetamine (Choice D) is a CNS stimulant that causes euphoria and increases sympathetic tone, leading to tachycardia, hypertension, pupillary dilation, and restlessness. Because of increased synaptic dopamine, hallucinations and paranoia can occur.

Educational Objective: Acute PCP intoxication can lead to psychosis, bizarre behavior, agitation, aggression, nystagmus, and ataxia. Control of psychomotor agitation is the first step in management of patients with PCP intoxication for the safety of the patient and medical staff. Chemical sedation with benzodiazepines such as intramuscular lorazepam or midazolam can be administered to control symptoms.

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11. A 38-year-old woman is brought to the emergency department by her husband 30 minutes after she sustained a generalized tonic-clonic seizure. Her husband reports that she has had worsening headache during the past 2 days and had the gradual onset of confusion 1 hour prior to the seizure. The patient has no history of serious illness. Her only medication is an oral contraceptive. She has smoked one pack of cigarettes daily for 20 years. On arrival, she is sleepy but arousable. Her temperature is 37.8°C (100°F). Physical examination shows no abnormalities. On mental status examination, she is oriented to person but not to place or time. She is distractible and recalls zero of three objects after 5 minutes. A T2-weighted MRI of the brain is shown. Which of the following is the most appropriate next step in diagnosis?

A) Brain biopsy
B) Cerebral angiography
C) EEG
D) Intracranial MR venography
E) Lumbar puncture

Correct Answer: E.

Herpes simplex encephalitis is a life-threatening infection caused by central nervous system (CNS) dissemination of herpes simplex virus, generally type 1 (HSV-1). HSV-1 commonly spreads to the CNS from the oropharynx via the trigeminal nerve or is reactivated from latent HSV-1 infection. Herpes simplex encephalitis presents with fever, altered mental status, seizure, and focal neurologic deficits, such as aphasia, hemiparesis, or cranial nerve dysfunction. Diagnosis involves polymerase chain reaction (PCR) to detect HSV-1 in the cerebrospinal fluid (requiring a lumbar puncture). The diagnosis is supported by neuroimaging that discloses unilateral or bilateral temporal

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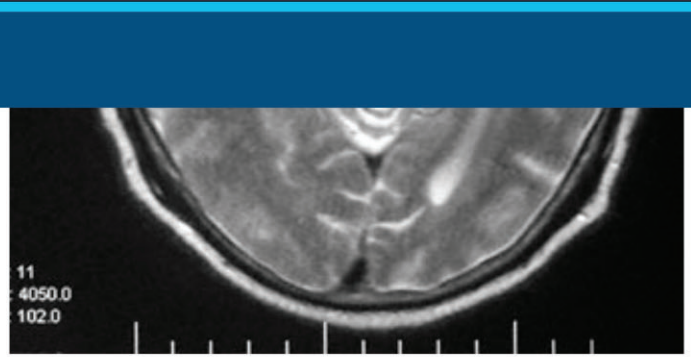
E) Lumbar puncture



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Incorrect Answers: A, B, C, and D.

Brain biopsy (Choice A) is used to exclude alternate diagnoses in patients with suspected HSV-1 who demonstrate negative PCR results or clinically worsen despite antiviral treatment. However, brain biopsy is associated with a risk for intracranial hemorrhage and should not be performed initially.

Cerebral angiography (Choice B) is used to visualize vascular abnormalities such as aneurysm or stenosis, which are common causes of strokes. Though this patient possesses risk factors for stroke such as smoking and taking an oral contraceptive pill, strokes typically present with the onset of focal neurologic deficits over minutes to hours rather than days. As well, thromboembolic strokes affecting the temporal lobe only are uncommon, since the temporal lobe receives its vascular supply from the middle cerebral arteries (MCA) and posterior cerebral arteries (PCA). Occlusion of the MCA and PCA commonly affect the frontal, parietal, and/or occipital lobe in addition to the temporal lobe.

EEG (Choice C) assists in diagnosing seizures but does not evaluate for the cause of the seizure. This patient with a clinical presentation and neuroimaging findings consistent with herpes simplex encephalitis (without evidence for an ongoing seizure) should receive a lumbar puncture for PCR analysis.

Intracranial MR venography (Choice D) is used to visualize the dural venous sinuses and diagnose cerebral sinus thrombosis. In cerebral sinus thrombosis, headache,

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Correct Answer: E.

Herpes simplex encephalitis is a life-threatening infection caused by central nervous system (CNS) dissemination of herpes simplex virus, generally type 1 (HSV-1). HSV-1 commonly spreads to the CNS from the oropharynx via the trigeminal nerve or is reactivated from latent HSV-1 infection. Herpes simplex encephalitis presents with fever, altered mental status, seizure, and focal neurologic deficits, such as aphasia, hemiparesis, or cranial nerve dysfunction. Diagnosis involves polymerase chain reaction (PCR) to detect HSV-1 in the cerebrospinal fluid (requiring a lumbar puncture). The diagnosis is supported by neuroimaging that discloses unilateral or bilateral temporal lobe abnormalities. Treatment requires intravenous acyclovir.

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Brain biopsy (Choice A) is used to exclude alternate diagnoses in patients with suspected HSV-1 who demonstrate negative PCR results or clinically worsen despite antiviral treatment. However, brain biopsy is associated with a risk for intracranial hemorrhage and should not be performed initially.

Cerebral angiography (Choice B) is used to visualize vascular abnormalities such as aneurysm or stenosis, which are common causes of strokes. Though this patient possesses risk factors for stroke such as smoking and taking an oral contraceptive pill, strokes typically present with the onset of focal neurologic deficits over minutes to hours rather than days. As well, thromboembolic strokes affecting the temporal lobe only are uncommon, since the temporal lobe receives its vascular supply from the middle cerebral arteries (MCA) and posterior cerebral arteries (PCA). Occlusion of the MCA and PCA commonly affect the frontal, parietal, and/or occipital lobe in addition to the temporal lobe.

EEG (Choice C) assists in diagnosing seizures but does not evaluate for the cause of the seizure. This patient with a clinical presentation and neuroimaging findings consistent with herpes simplex encephalitis (without evidence for an ongoing seizure) should receive a lumbar puncture for PCR analysis.

Intracranial MR venography (Choice D) is used to visualize the dural venous sinuses and diagnose cerebral sinus thrombosis. In cerebral sinus thrombosis, headache, seizure, and focal neurologic deficits are common. However, this patient demonstrates temporal lobe parenchymal abnormalities, which is consistent with herpes simplex encephalitis.

Educational Objective: Herpes simplex encephalitis is a life-threatening infection that typically presents with fever, altered mental status, seizure, and/or focal neurologic deficits. The diagnosis is made by PCR to detect HSV-1 in the cerebrospinal fluid and is supported by temporal lobe abnormalities on neuroimaging.

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12. A 54-year-old woman is brought to the emergency department because she was unable to move her right side or speak when she awoke this morning. Her husband reports that he found her in bed with these symptoms 25 minutes ago, when he returned home from working an overnight shift. He says she understood what he was saying to her but was unable to respond. He says she felt well the night before. He adds that she fainted three times during the past 2 years. She has no history of serious illness and takes no medications. She appears to be in distress. She seems to understand what is said to her but is unable to respond. She is 165 cm (5 ft 5 in) tall and weighs 82 kg (180 lb); BMI is 30 kg/m^2. Her temperature is 36.4°C (97.5°F), pulse is 80/min and regular, respirations are 12/min, and blood pressure is 142/89 mm Hg. Examination shows weakness of the right lower aspect of the face. Muscle strength is 3/5 in the right extremities. Babinski sign is present on the right. The remainder of the examination shows no abnormalities. MRI of the brain shows an infarct in the anterior branches of the left middle cerebral artery. Which of the following is the most appropriate pharmacotherapy?

A) Alteplase
B) Aspirin
C) Dabigatran
D) Heparin
E) Warfarin

Correct Answer: B.

Cerebral infarctions, or strokes, occur as a result of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic as a result of blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Risk factors for stroke include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Diagnosis is made by clinical evaluation and neuroimaging to confirm the diagnosis and exclude brain hemorrhage. Treatment depends on the duration of time since the patient was at their neurologic baseline. If the patient was at their neurologic baseline less than 4.5 hours before presentation, they are a candidate for thrombolytic therapy (eg, alteplase). If the patient was at their neurologic baseline more than 4.5 hours before presentation (as in this case, when the patient was last known to be healthy the night before presentation), then they are not a candidate for thrombolytic therapy and should instead be treated with aspirin therapy. As well, since this patient was at her neurologic baseline less than 24 hours ago and demonstrates an anterior circulation stroke, she may be a candidate for mechanical

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D) Heparin

E) Warfarin

Correct Answer: B.

Cerebral infarctions, or strokes, occur as a result of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic as a result of blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Risk factors for stroke include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Diagnosis is made by clinical evaluation and neuroimaging to confirm the diagnosis and exclude brain hemorrhage. Treatment depends on the duration of time since the patient was at their neurologic baseline. If the patient was at their neurologic baseline less than 4.5 hours before presentation, they are a candidate for thrombolytic therapy (eg, alteplase). If the patient was at their neurologic baseline more than 4.5 hours before presentation (as in this case, when the patient was last known to be healthy the night before presentation), then they are not a candidate for thrombolytic therapy and should instead be treated with aspirin therapy. As well, since this patient was at her neurologic baseline less than 24 hours ago and demonstrates an anterior circulation stroke, she may be a candidate for mechanical thrombectomy if a thrombus is visualized on imaging and is proximal. Other components of acute stroke management include blood pressure control, statin therapy, and deep venous thrombosis prevention.

Incorrect Answers: A, C, D, and E.

Alteplase (Choice A) should only be given if it is known that the patient was at her neurologic baseline 4.5 or fewer hours ago. If administered more than 4.5 hours after stroke onset, thrombolytic therapy leads to a higher rate of hemorrhagic transformation (conversion of the ischemic stroke to a hemorrhagic stroke), resulting in an extension of brain damage.

Dabigatran (Choice C), heparin (Choice D), and warfarin (Choice E) are anticoagulant medications that are not typically used in acute stroke management. If an ischemic stroke is caused by atrial fibrillation, these medications should be used long-term to prevent recurrent strokes.

Educational Objective: Acute stroke management depends on the time the patient was last known to be at their neurologic baseline. Patients who were at their baseline less than 4.5 hours before presentation and do not demonstrate a brain hemorrhage on neuroimaging are candidates for thrombolytic therapy. Patients who were at their baseline more than 4.5 hours before presentation should instead be treated with aspirin therapy.

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13. A previously healthy 47-year-old man comes to the emergency department because he has been unable to close his right eye during the past 4 hours. He noticed the problem while shaving this morning. During breakfast, he had difficulty closing his mouth to chew and could not taste his food. His temperature is 37.2°C (99°F), pulse is 84/min, respirations are 16/min, and blood pressure is 132/80 mm Hg. Examination of the face shows a loss of the right labial fold. There is no movement of the right side of the mouth when the patient is asked to smile, and he is unable to wrinkle the forehead on the right. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the head with contrast
B) MRI of the cervical spine
C) Lumbar puncture
D) Electromyelography and nerve conduction studies
E) No further testing is indicated

Correct Answer: E.

Bell palsy refers to a facial nerve palsy that leads to unilateral facial paralysis. It is most commonly caused by viral-mediated inflammation or immune reaction in the setting of a herpes simplex or herpes zoster infection, although it can be idiopathic or caused by other viral infections or Lyme disease. The facial nerve carries fibers that innervate the muscles of facial expression; therefore, Bell palsy presents with acute unilateral facial paralysis that includes forehead dysfunction. Alternatively, upper motor nerve lesions (eg, strokes) manifest with dysfunction of the lower face with sparing of the forehead (since the facial nerve nucleus controlling forehead musculature is dually innervated by upper motor neurons from bilateral precentral gyri). Consistent with facial nerve involvement, Bell palsy can be associated with loss of taste on the anterior two-thirds of the tongue and decreased lacrimation. Symptoms typically peak around 3 weeks, with slow recovery beginning within 6 months. Diagnosis is typically based on clinical symptoms, but electrodiagnostic tests (eg, electromyelography) and imaging of the face and head can be utilized if the diagnosis is unclear. Initial treatment consists of oral glucocorticoids, such as prednisone, and antiviral therapy in severe cases. Supportive care to prevent xerophthalmia or corneal abrasion should be undertaken (eg, artificial tears, eye patching).

Incorrect Answers: A, B, C, and D.

CT scan of the head (Choice A) is useful in the evaluation of strokes, which can affect the upper motor neurons that synapse on the facial nerve nucleus. This patient's

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Correct Answer: E.

Bell palsy refers to a facial nerve palsy that leads to unilateral facial paralysis. It is most commonly caused by viral-mediated inflammation or immune reaction in the setting of a herpes simplex or herpes zoster infection, although it can be idiopathic or caused by other viral infections or Lyme disease. The facial nerve carries fibers that innervate the muscles of facial expression; therefore, Bell palsy presents with acute unilateral facial paralysis that includes forehead dysfunction. Alternatively, upper motor nerve lesions (eg, strokes) manifest with dysfunction of the lower face with sparing of the forehead (since the facial nerve nucleus controlling forehead musculature is dually innervated by upper motor neurons from bilateral precentral gyri). Consistent with facial nerve involvement, Bell palsy can be associated with loss of taste on the anterior two-thirds of the tongue and decreased lacrimation. Symptoms typically peak around 3 weeks, with slow recovery beginning within 6 months. Diagnosis is typically based on clinical symptoms, but electrodiagnostic tests (eg, electromyelography) and imaging of the face and head can be utilized if the diagnosis is unclear. Initial treatment consists of oral glucocorticoids, such as prednisone, and antiviral therapy in severe cases. Supportive care to prevent xerophthalmia or corneal abrasion should be undertaken (eg, artificial tears, eye patching).

Incorrect Answers: A, B, C, and D.

CT scan of the head (Choice A) is useful in the evaluation of stroke, which can affect the upper motor neurons that synapse on the facial nerve nucleus. This patient's forehead involvement is consistent with lower motor neuron, not upper motor neuron, involvement.

MRI of the cervical spine (Choice B) can assist in diagnosing cervical spine parenchymal lesions or nerve root compression. The nerves contained within the spine primarily innervate the body below the head and are therefore not involved in producing this patient's symptoms.

Lumbar puncture (Choice C) is used in the evaluation of central nervous system infections such as bacterial and viral meningitis. While these infections can present with focal neurologic deficits, they are commonly associated with fever, nuchal rigidity, headache, and altered mental status.

Electromyelography and nerve conduction studies (Choice D) are commonly utilized to diagnose peripheral neuropathies. These electrophysiologic studies are used if the diagnosis of Bell palsy is unclear. However, this patient demonstrates typical Bell palsy signs, so the diagnosis can be made clinically.

Educational Objective: Bell palsy is a unilateral, viral-mediated or idiopathic facial nerve palsy that causes facial paralysis that does not spare the forehead. The diagnosis is clinical. Treatment involves glucocorticoids and occasionally antiviral therapy.

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14. A 32-year-old woman is brought to the emergency department because of a 1-day history of worsening confusion. Two months ago, she underwent successful gastric bypass for morbid obesity, but she has not adhered to her physician's instructions for health maintenance since she was discharged from the hospital. She has been taking no regular medications or supplements and has not followed the recommended diet. She has smoked one pack of cigarettes daily for 15 years, and she drinks two glasses of wine daily. On arrival, she is oriented to person but not to place or time. Vital signs are within normal limits. Examination shows disconjugate gaze and marked nystagmus. Muscle strength is normal bilaterally. She cannot stand with her feet together; she stands unsteadily with her feet 12 inches apart. Mental status examination shows moderately impaired attention. She is admitted to the hospital, and medical and physical therapy are begun. Her condition improves, and she is reexamined 1 week later in preparation for discharge home. The patient agrees to take all necessary medications and follow the recommended diet. Which of the following is the most appropriate next step to prevent future similar episodes in this patient?

A) Abstinence from alcohol
B) Adherence to a low-fat diet
C) Adherence to a low-protein diet
D) Vitamin B_1 (thiamine) supplementation
E) Vitamin B_{12} (cyanocobalamin) supplementation

Correct Answer: D.

Patients who have undergone gastric bypass surgery are at risk for vitamin deficiencies as a result of decreased oral intake and intestinal absorption of nutrients, and they usually depend on vitamin supplementation to maintain appropriate concentrations. Patients with nonadherence to vitamin regimens are at risk for thiamine (vitamin B_1) deficiency. Thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. The typical clinical presentation of Wernicke encephalopathy is a triad of acutely altered mental status, ophthalmoplegia (along with nystagmus), and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome if not immediately treated with high-dose parenteral thiamine. Wernicke-Korsakoff syndrome is an irreversible condition that features psychosis, anterograde and retrograde amnesia, and the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember. Adherence to thiamine supplementation is essential to decrease the risk for further episodes.

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E) Vitamin B_{12} (cyanocobalamin) supplementation

Correct Answer: D.

Patients who have undergone gastric bypass surgery are at risk for vitamin deficiencies as a result of decreased oral intake and intestinal absorption of nutrients, and they usually depend on vitamin supplementation to maintain appropriate concentrations. Patients with nonadherence to vitamin regimens are at risk for thiamine (vitamin B_1) deficiency. Thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. The typical clinical presentation of Wernicke encephalopathy is a triad of acutely altered mental status, ophthalmoplegia (along with nystagmus), and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome if not immediately treated with high-dose parenteral thiamine. Wernicke-Korsakoff syndrome is an irreversible condition that features psychosis, anterograde and retrograde amnesia, and the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember. Adherence to thiamine supplementation is essential to decrease the risk for further episodes.

Incorrect Answers: A, B, C, and E.

Abstinence from alcohol (Choice A) is not necessary for this patient. While chronic, heavy alcohol use is a major risk factor for thiamine deficiency, this patient's history of moderate alcohol use is more suggestive of bariatric surgery as the underlying cause of thiamine deficiency.

Adherence to a low-fat diet (Choice B) is helpful for patients who have undergone bariatric surgery but is not helpful for the treatment of Wernicke encephalopathy.

Adherence to a low-protein diet (Choice C) is not advisable for patients who have undergone bariatric surgery. These patients are often protein-deficient and may require supplementation. A low-protein diet is not helpful for the treatment of Wernicke encephalopathy.

Vitamin B_{12} (cyanocobalamin) supplementation (Choice E) is useful for the treatment of megaloblastic anemia resulting from vitamin B_{12} deficiency. This most commonly occurs in the context of veganism, pernicious anemia, and Crohn disease. It is not necessary to supplement in the case of Wernicke encephalopathy.

Educational Objective: Patients who have undergone gastric bypass surgery are at risk for vitamin deficiencies, particularly vitamin B_1 (thiamine) deficiency. Patients with thiamine deficiency are at risk for Wernicke encephalopathy and Wernicke-Korsakoff syndrome. Adherence to thiamine supplementation is essential to decrease the risk for further episodes.

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15. An 8-year-old girl is brought to the emergency department by her father because of swelling of the right side of her neck. The father first noticed a small lump on her neck last week and says it seems larger today; it also has become discolored and now resembles a bruise. The patient has not had fever or changes in energy or appetite. She has had no recent infections or contact with anyone known to be ill. The family has not traveled outside of the United States, but they spend weekends on the patient's grandparents' ranch. The patient is at the 50th percentile for height, weight, and BMI. Vital signs are within normal limits. She appears well. Physical examination shows a 3 × 5-cm firm, mobile mass in the right anterior cervical chain region; there is no erythema and the mass is minimally tender. A purplish hue is noted over the mass. There is no other lymphadenopathy, and no hepatomegaly or splenomegaly is noted. Excisional biopsy specimen of the mass shows the presence of multiple granulomas. Which of the following infectious agents is the most likely cause of this patient's condition?

A) Cytomegalovirus
B) Epstein-Barr virus
C) *Haemophilus influenzae*, type b
D) *Mycobacterium avium-intracellulare*
E) *Staphylococcus aureus*

Correct Answer: D.

Mycobacterium avium-intracellulare infection in the most likely cause of this patient's unilateral cervical adenopathy with an overlying purplish hue and evidence of granuloma formation on biopsy. Lymphadenitis secondary to *Mycobacterium tuberculosis* (MTB) used to be relatively common in immunocompetent children, but infection with *M. avium* is now more common than MTB infection as a cause of lymphadenitis. Patients frequently develop unilateral cervical adenopathy with a dominant lymph node that slowly expands over weeks to months. The purplish discoloration is almost pathognomonic for *Mycobacterium spp*. infection, and if untreated, it is common for the lymph node to ulcerate, form a fistula, and spontaneously drain through the skin. Biopsy showing caseating granulomas and organisms on acid-fast stain is characteristic of this infection. Definitive treatment is with surgical excision, although in cases in which the affected lymph node is close to important structures such as the facial nerve, combination therapy with a macrolide and ethambutol with or without rifampin can be considered. Antibiotics are often sufficient management of lymphadenitis in children. *Bartonella* (cat-scratch disease) and *Francisella* (tularemia) species should also be considered.

Incorrect Answers: A, B, C, and E.

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D) *Mycobacterium avium-intracellulare*

E) *Staphylococcus aureus*

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Cytomegalovirus (Choice A) and Epstein-Barr virus (EBV) (Choice B) infection in immunocompetent individuals may cause mononucleosis, which is characterized by fatigue, fever, and pharyngitis with or without adenopathy. Laboratory findings usually demonstrate atypical lymphocytosis. Granuloma formation is not characteristic. Cytomegalovirus is often clinically indistinguishable from EBV infection. Differentiation between the two entities is usually made by assessing for the presence of heterophile antibodies.

Haemophilus influenzae, type b (Choice C) causes a variety of infections in unvaccinated patients, but routine vaccination of children is now standard of care. Classically this organism causes pneumonia, bacteremia, epiglottitis, meningitis, and otitis media.

Staphylococcus aureus (Choice E) can cause lymphadenitis, but biopsy would not show granuloma formation.

Educational Objective: *Mycobacterium avium* lymphadenitis is relatively common in immunocompetent children and frequently presents with unilateral cervical lymphadenopathy. An overlying purplish hue is essentially pathognomonic for mycobacterial infection. Diagnosis is made by biopsy and treatment involves antimicrobial therapy or surgical excision.

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16. A 55-year-old woman with a 10-year history of type 2 diabetes mellitus returns to the clinic for a follow-up examination of a right foot ulcer diagnosed 8 weeks ago. At that time, she was treated with hydrocolloid dressings. Today, the patient reports a 1-week history of chills and moderate mid back pain. She has not had cough, pain with urination, or diarrhea. She also has hypertension. Medications are metformin and lisinopril. The patient is 160 cm (5 ft 2 in) tall and weighs 88 kg (195 lb); BMI is 35 kg/m^2. Her temperature is 38.2°C (100.8°F), pulse is 90/min, respirations are 18/min, and blood pressure is 132/80 mm Hg. Examination shows a stage 2 foot ulcer that measures 2 cm in diameter and point tenderness over the T12 spinous process. The remainder of the examination shows no abnormalities. Which of the following studies is most likely to confirm the cause of this patient's fever and back pain?

A) Blood cultures
B) Determination of erythrocyte sedimentation rate
C) Echocardiography
D) MRI of the thoracic spine
E) Ultrasonography of the abdomen

Correct Answer: D.

MRI of the thoracic spine is likely to confirm the presence of vertebral osteomyelitis, which is an infection of the vertebral body that frequently develops as a result of hematogenous seeding secondary to bacteremia. In this case, the patient's diabetic foot ulcer is the most likely source of infection. Patients with vertebral osteomyelitis often present with the insidious onset of back pain, fever, malaise, and fatigue. Physical examination often demonstrates point tenderness at the level of the affected vertebral body. Laboratory evaluation often discloses leukocytosis and increased inflammatory markers such as erythrocyte sedimentation rate and c-reactive protein. Blood cultures should always be obtained in an attempt to identify the causal organism. Bone biopsy is frequently required since blood cultures are positive in only about half of cases, and ideally this should be done prior to beginning antibiotic therapy if possible. While many pathogens can cause osteomyelitis, the most commonly identified organisms include *Staphylococcus aureus*, *Streptococcus viridans*, and aerobic gram-negative bacilli. In rare cases, patients may develop infections with *Brucella spp*. or *Mycobacterium tuberculosis*. Treatment is with intravenous antibiotics for a period of 6 to 12 weeks. Untreated infection can progress to epidural abscess with devastating neurologic consequences.

Incorrect Answers: A, B, C, and E.

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E) Ultrasonography of the abdomen

Correct Answer: D.

MRI of the thoracic spine is likely to confirm the presence of vertebral osteomyelitis, which is an infection of the vertebral body that frequently develops as a result of hematogenous seeding secondary to bacteremia. In this case, the patient's diabetic foot ulcer is the most likely source of infection. Patients with vertebral osteomyelitis often present with the insidious onset of back pain, fever, malaise, and fatigue. Physical examination often demonstrates point tenderness at the level of the affected vertebral body. Laboratory evaluation often discloses leukocytosis and increased inflammatory markers such as erythrocyte sedimentation rate and c-reactive protein. Blood cultures should always be obtained in an attempt to identify the causal organism. Bone biopsy is frequently required since blood cultures are positive in only about half of cases, and ideally this should be done prior to beginning antibiotic therapy if possible. While many pathogens can cause osteomyelitis, the most commonly identified organisms include *Staphylococcus aureus*, *Streptococcus viridans*, and aerobic gram-negative bacilli. In rare cases, patients may develop infections with *Brucella spp*. or *Mycobacterium tuberculosis*. Treatment is with intravenous antibiotics for a period of 6 to 12 weeks. Untreated infection can progress to epidural abscess with devastating neurologic consequences.

Incorrect Answers: A, B, C, and E.

Blood cultures (Choice A) are frequently positive in cases of vertebral osteomyelitis, but positive blood cultures are also seen in a variety of other infections. This patient requires blood cultures in addition to imaging to confirm the suspected diagnosis of vertebral osteomyelitis.

Determination of erythrocyte sedimentation rate (Choice B) is helpful but nonspecific since it is increased in many infectious and noninfectious inflammatory conditions.

Echocardiography (Choice C) may be required to rule out endocarditis if the patient has evidence of bacteremia, but this is premature.

Ultrasonography of the abdomen (Choice E) is unlikely to provide any useful diagnostic information in this patient with signs and symptoms most consistent with vertebral osteomyelitis.

Educational Objective: Vertebral osteomyelitis commonly occurs via hematogenous spread from another site of infection. Presenting symptoms include back pain, fever, and malaise, with physical examination often showing point tenderness over the affected vertebral body. MRI is the imaging modality of choice and should be performed to confirm the diagnosis and exclude epidural abscess or discitis.

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17. A 67-year-old woman comes to the physician because of a 1-week history of moderate pain and swelling, redness, and warmth of her right knee. She has a 10-year history of moderate pain and progressive stiffness of her hands and a 1-year history of swelling and warmth of her digits and wrists. She says she has generalized stiffness for 1 hour after awakening in the morning. She has no history of trauma to the hands or knees. She has no history of serious illness and takes ibuprofen for the pain as needed. Vital signs are within normal limits. On examination, the metacarpophalangeal joints are boggy bilaterally and tender on squeezing. There is erythema and swelling of the right knee; the patella is ballotable. Which of the following is the most appropriate next step in management?

A) X-ray of the right knee
B) Oral naproxen therapy
C) Oral oxycodone therapy as needed for pain
D) Oral prednisone therapy
E) Arthrocentesis of the right knee

Correct Answer: E.

Rheumatoid arthritis is an autoimmune disease that causes extensive inflammation in synovial tissues. The clinical course is characterized by joint destruction, periarticular bone loss, and synovial hypertrophy, along with extra-articular manifestations such as rheumatoid nodules, pulmonary fibrosis, and skin rash. Patients often present with symmetric involvement of multiple joints, most commonly the metacarpophalangeal and proximal interphalangeal joints of the hands, demonstrating articular erosions and progressive joint space narrowing on x-rays. Ulnar deviation of the fingers along with boutonnière and swan neck deformities commonly occur. In this patient with a red, swollen, and warm knee, arthrocentesis should be performed to rule out septic arthritis, since patients with rheumatoid arthritis are at an increased risk for septic arthritis. Arthrocentesis in rheumatoid arthritis generally discloses 10,000 to 50,000 leukocytes/mm^3 whereas septic arthritis typically discloses greater than 50,000 leukocytes/mm^3. Serologic studies generally demonstrate a positive rheumatoid factor and anti–cyclic citrullinated peptide antibodies. Rheumatoid arthritis is associated with the HLA–DR4 genotype.

Incorrect Answers: A, B, C, and D.

X-ray of the right knee (Choice A) would be indicated in the setting of acute pain and trauma. It would be unhelpful in this patient with no history of trauma, making a

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D) Oral prednisone therapy

E) Arthrocentesis of the right knee

Correct Answer: E.

Rheumatoid arthritis is an autoimmune disease that causes extensive inflammation in synovial tissues. The clinical course is characterized by joint destruction, periarticular bone loss, and synovial hypertrophy, along with extra-articular manifestations such as rheumatoid nodules, pulmonary fibrosis, and skin rash. Patients often present with symmetric involvement of multiple joints, most commonly the metacarpophalangeal and proximal interphalangeal joints of the hands, demonstrating articular erosions and progressive joint space narrowing on x-rays. Ulnar deviation of the fingers along with boutonnière and swan neck deformities commonly occur. In this patient with a red, swollen, and warm knee, arthrocentesis should be performed to rule out septic arthritis, since patients with rheumatoid arthritis are at an increased risk for septic arthritis. Arthrocentesis in rheumatoid arthritis generally discloses 10,000 to 50,000 leukocytes/mm^3 whereas septic arthritis typically discloses greater than 50,000 leukocytes/mm^3. Serologic studies generally demonstrate a positive rheumatoid factor and anti–cyclic citrullinated peptide antibodies. Rheumatoid arthritis is associated with the HLA–DR4 genotype.

Incorrect Answers: A, B, C, and D.

X-ray of the right knee (Choice A) would be indicated in the setting of acute pain and trauma. It would be unhelpful in this patient with no history of trauma, making a fracture unlikely.

Nonsteroidal anti-inflammatory drugs (NSAIDs) such as naproxen (Choice B), systemic glucocorticoids such as prednisone (Choice D), intra-articular glucocorticoids, and disease-modifying antirheumatic drugs (DMARDs) are all acceptable in the treatment and management of patients with rheumatoid arthritis. However, further diagnostic evaluation should be performed to rule out septic arthritis prior to initiating therapy.

Opioid analgesics such as oxycodone (Choice C) can be used for pain management in patients with end-stage rheumatoid joint disease or temporarily during acute flares in patients with severe involvement. They may be initiated now, but a diagnosis should be established.

Educational Objective: Rheumatoid arthritis is an inflammatory arthropathy that causes extensive inflammation in synovial tissues and typically presents with symmetric patterns of arthritis, particularly in the wrists and hands. Patients with a history of inflammatory joint disease are at an increased risk for septic arthritis.

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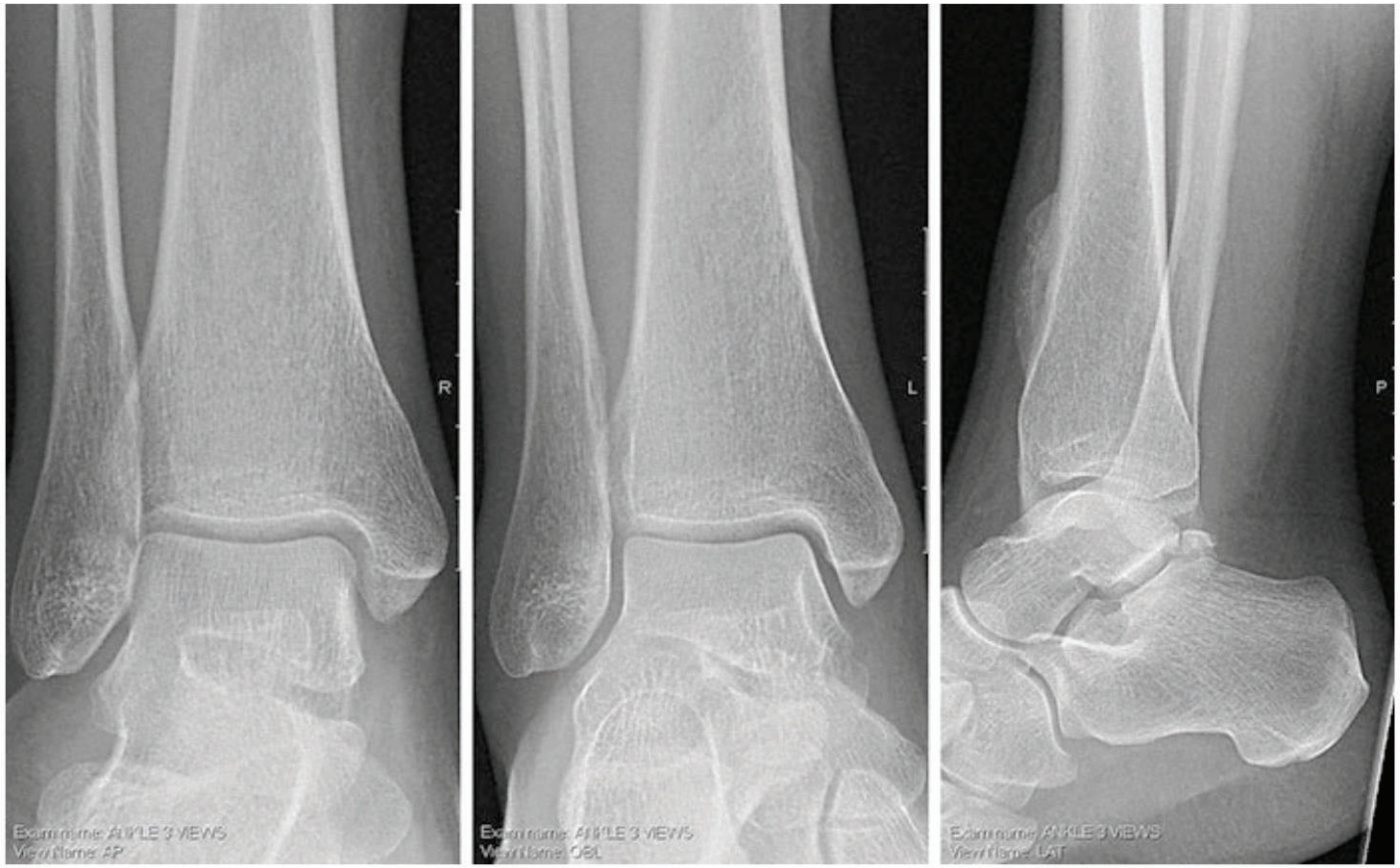

18. A 22-year-old woman comes to the office because of a 6-week history of mild pain and swelling in the front of her right ankle. She says her symptoms began after she awkwardly stepped off a curb. There is no personal or family history of serious illness. Her only medication is ibuprofen as needed for pain. She does not smoke cigarettes or drink alcohol. Vital signs are within normal limits. Examination shows a 1-cm abrasion and mild ecchymosis over the anterolateral aspect of the right

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18. A 22-year-old woman comes to the office because of a 6-week history of mild pain and swelling in the front of her right ankle. She says her symptoms began after she awkwardly stepped off a curb. There is no personal or family history of serious illness. Her only medication is ibuprofen as needed for pain. She does not smoke cigarettes or drink alcohol. Vital signs are within normal limits. Examination shows a 1-cm abrasion and mild ecchymosis over the anterolateral aspect of the right ankle. There is warmth and swelling at the right anterior ankle joint; passive dorsiflexion produces pain. Anterior drawer test is negative bilaterally. Muscle strength is 5/5 on inversion, eversion, dorsiflexion, and plantar flexion of the right ankle. Dorsalis pedis pulses are 2+ bilaterally. Sensation to light touch is intact over the lower extremities. X-rays of the right ankle are shown. Which of the following is the most appropriate next step in diagnosis?

A) Bone biopsy
B) Complete blood count
C) Joint aspiration of the right ankle
D) MRI of the right tibia
E) Ultrasonography of the right lower extremity

Correct Answer: D.

Osteosarcoma, the most common type of primary bone cancer, often occurs in persons under age 30 years. Osteosarcoma typically occurs in long bones, frequently above the knee in the distal femur or below the knee in the proximal tibia. While rare, osteosarcoma may occur in the distal tibia. The initial presentation often includes pain and swelling; sometimes, a fragility fracture is the declaring presentation. Causes include familial cases (especially involving the retinoblastoma or *P53* tumor-suppressor genes), bony dysplasia such as osteitis deformans (Paget disease) and fibrous dysplasia, and exposure to radiation. Plain x-rays typically demonstrate destruction of both medullary and cortical bone as well as a sunburst periosteal reaction. Once osteosarcoma is suspected, an MRI is indicated to evaluate the extent of local invasion and to allow for local staging. Osteosarcoma is an aggressive tumor with a poor prognosis. Treatment requires aggressive surgical resection as well as chemotherapy.

Incorrect Answers: A, B, C, and E.

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D) MRI of the right tibia

E) Ultrasonography of the right lower extremity

Correct Answer: D.

Osteosarcoma, the most common type of primary bone cancer, often occurs in persons under age 30 years. Osteosarcoma typically occurs in long bones, frequently above the knee in the distal femur or below the knee in the proximal tibia. While rare, osteosarcoma may occur in the distal tibia. The initial presentation often includes pain and swelling; sometimes, a fragility fracture is the declaring presentation. Causes include familial cases (especially involving the retinoblastoma or *P53* tumor-suppressor genes), bony dysplasia such as osteitis deformans (Paget disease) and fibrous dysplasia, and exposure to radiation. Plain x-rays typically demonstrate destruction of both medullary and cortical bone as well as a sunburst periosteal reaction. Once osteosarcoma is suspected, an MRI is indicated to evaluate the extent of local invasion and to allow for local staging. Osteosarcoma is an aggressive tumor with a poor prognosis. Treatment requires aggressive surgical resection as well as chemotherapy.

Incorrect Answers: A, B, C, and E.

Bone biopsy (Choice A) is necessary for the diagnosis of osteosarcoma and can be performed either via open biopsy or core needle biopsy. A prior MRI is necessary for proper planning of the biopsy so that the biopsy procedure does not interfere with subsequent surgical excision.

Complete blood count (Choice B) is useful for the evaluation of leukemia. While leukemia may present with bone pain, it does not typically cause bony erosion and periosteal reaction.

Joint aspiration of the right ankle (Choice C) is useful for the diagnosis of septic arthritis. Septic arthritis presents with an acute fever, joint pain, swelling, and erythema.

Ultrasonography of the right lower extremity (Choice E) is useful for the diagnosis of deep venous thrombosis (DVT). DVT presents with unilateral lower extremity pain, erythema, and edema, along with tenderness on palpation and pain exacerbated with passive stretch of the foot.

Educational Objective: Osteosarcoma is an aggressive primary bone cancer that typically occurs in long bones. Plain x-rays demonstrate destruction of both medullary and cortical bone as well as a sunburst periosteal reaction. Once osteosarcoma is suspected, an MRI is indicated to evaluate the extent of local invasion and to allow for staging.

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19. A 16-year-old girl is brought to the physician because of generalized weakness for the past 3 days. She states that during the past month, she has been following a strict diet and taking laxatives and diuretics to lose weight. She has no history of serious illness. Vital signs are within normal limits. Examination shows diffuse, generalized weakness; there is no pain on muscle palpation. Deep tendon reflexes are 1+ in the upper and lower extremities. A decreased concentration of which of the following serum electrolytes is the most likely cause of this patient's muscle weakness?

A) Calcium
B) Chloride
C) Magnesium
D) Potassium
E) Sodium

Correct Answer: D.

Potassium is present in significant concentrations within gastrointestinal secretions, the excessive loss of which may lead to hypokalemia. Excessive gastrointestinal potassium loss may result secondary to abuse of laxatives, or due to other causes such as infectious diarrhea or vasoactive intestinal peptide secreting tumors (VIPoma). Hypokalemia typically presents with muscle weakness as a result of perturbations in transmembrane potential, as well as cramps, abdominal ileus, paresthesia, and hyporeflexia. It can also lead to life-threatening cardiac arrhythmias, such as premature atrial or ventricular complexes, long QT syndrome, or torsades de pointes (polymorphic ventricular tachycardia). Electrolyte disturbances caused by laxative abuse may lead to either metabolic acidosis or alkalosis. Treatment focuses on reversing inciting conditions and repleting deficient electrolytes.

Incorrect Answers: A, B, C, and E.

Calcium (Choice A) loss (hypocalcemia) presents with perioral paresthesia, carpopedal spasm, laryngospasm, and prolonged QT interval. Hypocalcemia may result from hypoparathyroidism, low vitamin D, or chronic kidney disease. It does not typically occur in the setting of laxative abuse.

Chloride (Choice B) loss (hypochloremia) typically occurs in the setting of other electrolyte abnormalities, especially sodium and fluid imbalances, and often is

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D) Potassium

E) Sodium

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

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Chloride (Choice B) loss (hypochloremia) typically occurs in the setting of other electrolyte abnormalities, especially sodium and fluid imbalances, and often is asymptomatic. It is typically observed in the setting of upper gastrointestinal volume loss from vomiting (eg, in the setting of bulimia nervosa or hyperemesis gravidarum).

Magnesium (Choice C) loss (hypomagnesemia) is often asymptomatic if mild, but when severe can lead to symptoms such as cardiac arrhythmias, seizures, or tetany. It is typically secondary to renal losses, and while it may occur as a result of chronic diarrhea, this is observed less frequently than hypokalemia in patients who abuse laxatives. It is commonly deficient in alcohol abuse.

Sodium (Choice E) loss (hyponatremia) presents with nausea, malaise, lethargy, obtundation or coma, and seizures secondary to cerebral edema. It does not typically result from laxative abuse but can occur if such abuse results in hypovolemia.

Educational Objective: Hypokalemia typically presents with muscle weakness as a result of perturbations in transmembrane potential, as well as cramps, ileus, paresthesia, hyporeflexia, and cardiac arrhythmias. Excessive gastrointestinal potassium loss may occur as a result of the abuse of laxatives.

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20. A 61-year-old man with ischemic cardiomyopathy is admitted to the hospital for management of community-acquired pneumonia. His medications are furosemide, spironolactone, and lisinopril. He has a dietary sodium restriction of less than 1500 mg daily. His temperature is 38.8°C (101.8°F), pulse is 100/min, respirations are 22/min, and blood pressure is 128/74 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Crackles are heard in the middle lobe of the right lung. There is no edema of the lower extremities. A chest x-ray shows a right middle lobe infiltrate. His ejection fraction is 30%. Which of the following is the most appropriate intravenous fluid maintenance therapy?

A) 5% Dextrose in 0.45% saline
B) 5% Dextrose in 0.9% saline
C) 5% Dextrose in water
D) 0.9% Saline
E) No intravenous fluids are indicated

Correct Answer: E.

This patient presents with community-acquired pneumonia in the setting of heart failure with decreased ejection fraction. Patients with infection and evidence of a systemic inflammatory response (fever or hypothermia, tachycardia, tachypnea, leukocytosis or leukopenia) are at risk for impaired perfusion from vasodilation and distributive shock. In patients with heart failure, cirrhosis, and end-stage renal disease, physicians are often reluctant to provide adequate fluid resuscitation because of concerns about volume overload. However, the risk for mortality is greater for patients who do not receive adequate fluid resuscitation if evidence of hypoperfusion is present, such as hypotension, altered mental status, or abnormal laboratory chemistry values indicating organ dysfunction. In this patient who is presenting without hypotension, no intravenous fluids are indicated at this time. His volume-depleting and blood pressure-lowering medications should be held, and he should be admitted to the hospital for antibiotics and monitoring.

Incorrect Answers: A, B, C, and D.

If the patient develops hypotension or presents with evidence of impaired perfusion, initial fluid resuscitation in the setting of sepsis can be accomplished with a variety of crystalloid and colloid solutions. Isotonic crystalloid solutions such as 0.9% saline (Choice D) or lactated Ringer solution are preferred because of their low cost, high

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A) 5% Dextrose in 0.45% saline
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Educational Objective: Adequate fluid resuscitation is an essential component of managing severe sepsis and septic shock. Patients with hypotension or evidence of impaired perfusion should receive immediate fluid resuscitation.

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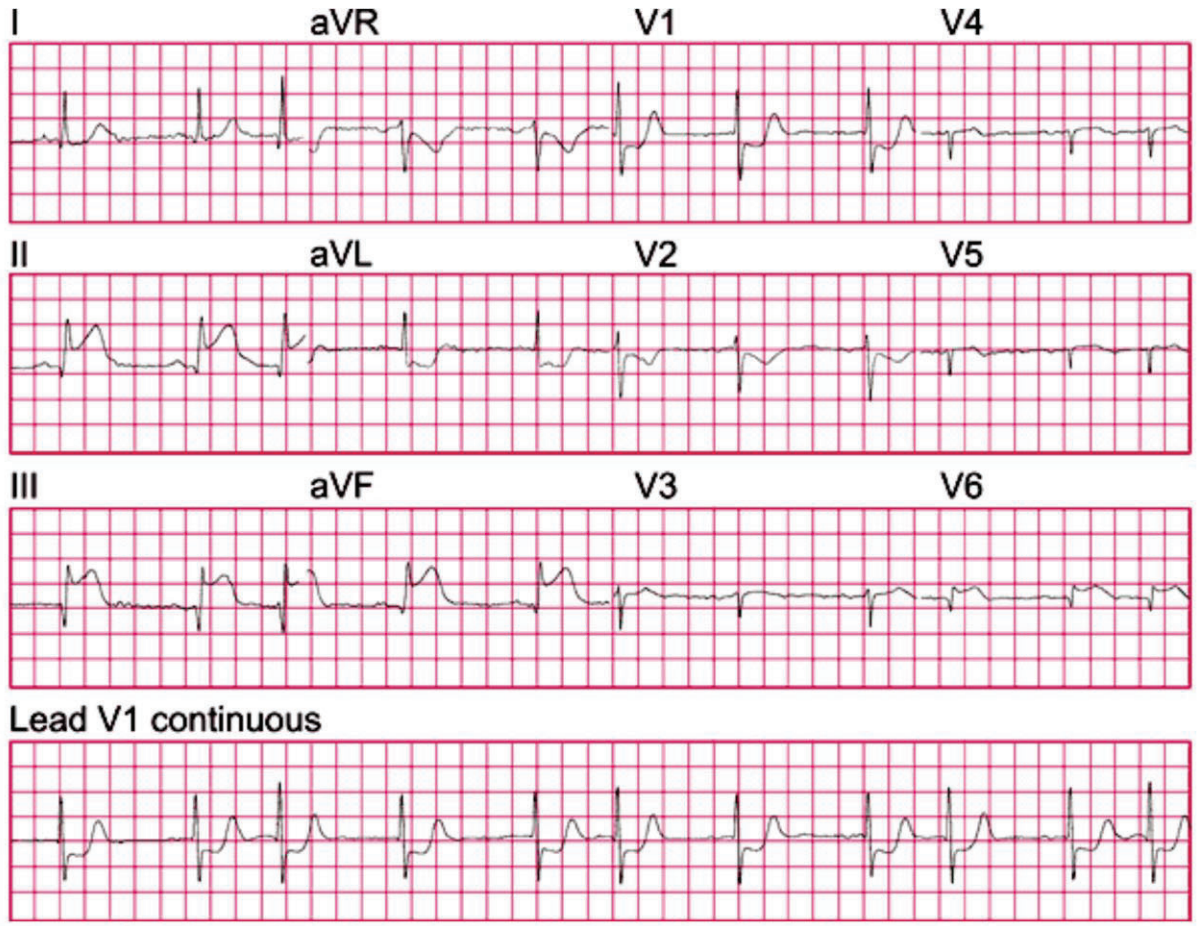

21. A 64-year-old woman is brought to the emergency department because of a 3-hour history of shortness of breath, nausea, and vomiting. She has not had fever or chest or abdominal pain. She has not had any sick contacts. She has hypertension and type 2 diabetes mellitus. Her medications are lisinopril, insulin, and aspirin.

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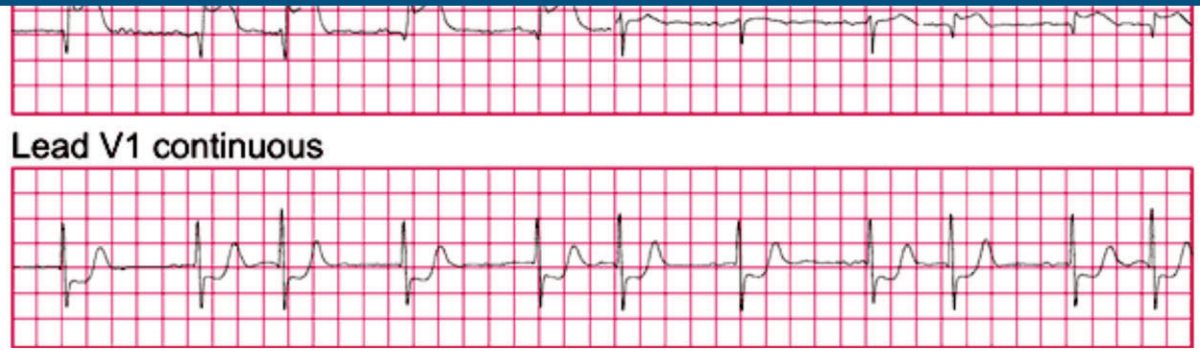

21. A 64-year-old woman is brought to the emergency department because of a 3-hour history of shortness of breath, nausea, and vomiting. She has not had fever or chest or abdominal pain. She has not had any sick contacts. She has hypertension and type 2 diabetes mellitus. Her medications are lisinopril, insulin, and aspirin. On arrival, she is in acute distress. Her pulse is 64/min with occasional premature beats, respirations are 22/min, and blood pressure is 90/50 mm Hg. The lungs are clear to auscultation. On cardiac examination, S_1 and S_2 are normal and an S_4 is heard; there are no murmurs. The abdomen is soft and nontender. There is no peripheral edema. An ECG is shown. Chest x-ray shows no pulmonary edema. Administration of which of the following is contraindicated in this patient?

A) Heparin
B) Nitroglycerin
C) 0.9% Saline
D) Simvastatin
E) Streptokinase

Correct Answer: B.

Administration of nitroglycerin is contraindicated in this patient presenting with features of a right ventricular myocardial infarction (RVMI). She has multiple risk factors for coronary artery disease and presents with dyspnea, nausea, and hypotension. The ECG shows ST-segment elevations in the inferior leads II, III, and aVF with depressions in the anterior precordial leads. Cardiac rhythm disturbances are common in RVMI as a result of impaired perfusion to the sinoatrial and atrioventricular nodes. Patients with RVMI become exceptionally preload-dependent because of the impaired function of the right ventricle. Acute management consists of intravenous

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Incorrect Answers: A, C, D, and E.

With the exception of avoiding nitrates and opioid analgesics to prevent decreased preload and hemodynamic collapse, management of RVMI is otherwise similar to treatment of other types of acute myocardial infarction. Early anticoagulation with heparin (Choice A), dual antiplatelet therapy, and statin therapy such as with simvastatin (Choice D) improve morbidity and mortality. Reperfusion, particularly via PCI, is indicated as soon as possible. Fibrinolytics such as streptokinase (Choice E) may be used in settings where timely PCI is not available.

Optimization of right ventricular preload with intravenous fluids, such as 0.9% saline (Choice C), is also particularly important in the management of RVMI to maintain adequate cardiac output.

Educational Objective: Right ventricular myocardial infarction is characterized by ST-segment changes in the inferior leads and arrhythmias (especially heart block). Right-sided precordial leads may also show ST-segment changes. Nitrates and opioids are contraindicated since the right ventricle is highly preload-dependent.

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22. A 57-year-old woman comes to the physician as a new patient. She has type 2 diabetes mellitus that was poorly controlled with glyburide for 10 years; it has been better controlled with the addition of metformin for the past 2 years. She does not smoke cigarettes or drink alcohol. She is 152 cm (5 ft) tall and weighs 63 kg (140 lb); BMI is 27 kg/m^2. Her blood pressure is 165/102 mm Hg on three measurements. One year ago, her blood pressure was 144/90 mm Hg. Examination today shows no abnormalities. Serum studies show electrolyte concentrations within the reference ranges and a creatinine concentration of 0.9 mg/dL. Urinalysis shows 4+ protein. Which of the following is the most likely mechanism of this patient's increased blood pressure?

A) Aldosterone-secreting adrenal tumor
B) Atherosclerosis of the renal arteries
C) Epinephrine-secreting adrenal tumor
D) Renal parenchymal disease
E) Renin-secreting adrenal tumor

Correct Answer: D.

Long-standing hyperglycemia such as that in diabetes mellitus can result in diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles. This results in thickening of the basement membrane along with compromise of the filtration barrier, which leads to an increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole also occurs, which can initially increase the glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson nodules, on light microscopy if a biopsy is taken. The combination of increased basement membrane permeability and initially increased GFR progresses over time in patients with diabetes mellitus, beginning as microalbuminuria, progressing to macroalbuminuria (as seen in this case), and eventually to end-stage renal disease. Diabetic renal disease is the most likely mechanism for the patient's increased blood pressure related to associated increased extracellular volume along with increased renin-angiotensin-aldosterone system activation.

Incorrect Answers: A, B, C, and E.

Hyperaldosteronism resulting from an aldosterone-secreting adrenal tumor (Choice A) can cause secondary hypertension. Excess aldosterone production from an adrenal

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Correct Answer: D.

Long-standing hyperglycemia such as that in diabetes mellitus can result in diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles. This results in thickening of the basement membrane along with compromise of the filtration barrier, which leads to an increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole also occurs, which can initially increase the glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson nodules, on light microscopy if a biopsy is taken. The combination of increased basement membrane permeability and initially increased GFR progresses over time in patients with diabetes mellitus, beginning as microalbuminuria, progressing to macroalbuminuria (as seen in this case), and eventually to end-stage renal disease. Diabetic renal disease is the most likely mechanism for the patient's increased blood pressure related to associated increased extracellular volume along with increased renin-angiotensin-aldosterone system activation.

Incorrect Answers: A, B, C, and E.

Hyperaldosteronism resulting from an aldosterone-secreting adrenal tumor (Choice A) can cause secondary hypertension. Excess aldosterone production from an adrenal adenoma or bilateral adrenal hyperplasia causes hypertension from salt and water retention but would also present with hypokalemia and metabolic alkalosis.

Atherosclerosis of the renal arteries (Choice B) causes secondary hypertension as a result of abnormal activation of the renin-angiotensin-aldosterone system. An abdominal bruit may be appreciated in the region of the stenosis. Diagnosis is established with renal artery Doppler ultrasound or magnetic resonance angiography, which are able to quantify the degree of renal artery stenosis and associated renal atrophy.

A pheochromocytoma is often located in the adrenal gland or within the para-aortic chain; they produce an excess of metanephrines, such as epinephrine (Choice C). Pheochromocytomas present with episodes of increased blood pressure, headache, and palpitations.

A renin-secreting adrenal tumor (Choice E) would cause hypertension along with hypokalemia.

Educational Objective: Diabetic nephropathy occurs following nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles, characteristically presenting as Kimmelstiel-Wilson lesions on light microscopy. It progresses over time in patients with diabetes mellitus, initially beginning as microalbuminuria, which can subsequently lead to macroalbuminuria and then end-stage renal disease.

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23. A 25-year-old woman comes to the office for a health maintenance examination. She is on active duty in the US Air Force, and her primary duty is flying drones. She reports no symptoms. Medical history is unremarkable, and she takes no medications. She does not smoke cigarettes or drink alcoholic beverages. Her paternal grandmother had a myocardial infarction at the age of 62 years. Vital signs are within normal limits. Physical examination discloses no abnormalities. Results of fasting serum lipid studies obtained 1 year ago are shown:

Cholesterol	
Total	205 mg/dL
HDL-cholesterol	45 mg/dL
LDL-cholesterol	150 mg/dL
Triglycerides	50 mg/dL

Which of the following is the most appropriate screening laboratory study at this time?

A) LDL-receptor activity assay
B) Measurement of serum apolipoprotein(a) concentration
C) Measurement of serum C-reactive protein concentration
D) Repeat measurement of fasting serum lipid studies
E) No further testing is indicated

Correct Answer: E.

No further testing is indicated for this patient. Women under the age of 40 to 45 years typically do not require screening for hyperlipidemia unless there is a compelling reason, such as a family history of familial hyperlipidemia or a myocardial infarction (MI) or stroke at a very young age. The American College of Physicians recommends that cholesterol concentrations should be assessed in asymptomatic men over the age of 35 years and asymptomatic women over the age of 40 to 45 years. For patients between the ages of 40 and 75 years with no history of cardiovascular disease, the atherosclerotic cardiovascular disease (ASCVD) risk calculator can be helpful in determining the benefit of adding a statin medication to lower cholesterol concentrations. The ASCVD calculator provides an estimate as to the probability that the patient will experience a stroke or a myocardial infarction in the next 10 years based on age, smoking status, race, blood pressure, and cholesterol concentration. A risk of less

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B) Measurement of serum apolipoprotein(a) concentration

C) Measurement of serum C-reactive protein concentration

D) Repeat measurement of fasting serum lipid studies

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Incorrect Answers: A, B, C, and D.

LDL-receptor activity assay (Choice A) is indicated when testing for familial hypercholesterolemia, but this patient does not have a family history of this condition and her cholesterol concentrations are only marginally increased.

Measurement of serum apolipoprotein(a) concentration (Choice B) is not routinely indicated for patients. Low concentrations of apolipoprotein(a) lead to low HDL-cholesterol, which is associated with an increased risk for cardiovascular disease.

Measurement of serum C-reactive protein (CRP) concentration (Choice C), particularly high sensitivity CRP, is sometimes used to risk stratify patients with an intermediate risk for cardiovascular disease. Higher concentrations are associated with an increased risk for heart disease.

Repeat measurement of fasting serum lipid studies (Choice D) is indicated for routine screening when this patient reaches the age of 40 to 45 years. Since measuring lipids again will not change management, it should not be done.

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Repeat measurement of fasting serum lipid studies (Choice D) is indicated for routine screening when this patient reaches the age of 40 to 45 years. Since measuring lipids again will not change management, it should not be done.

Educational Objective: While variation exists in clinical practice, most asymptomatic men over the age of 35 years and women over the age of 40 to 45 years should be screened for hyperlipidemia. Patients below these ages rarely have an indication for screening unless there is a compelling reason, such as a family history of hypercholesterolemia or early cardiovascular disease in a first-degree relative.

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24. A 57-year-old man comes to the physician because of a 3-month history of an open wound on the left leg; the wound has been increasing in size during this time. He also has had mild pain and the sensation of heaviness in the entire left leg during this time; the pain is worst at the end of the day and improves with leg elevation. His medications are inhaled albuterol as needed for asthma and acetaminophen as needed for the leg pain. He has smoked one pack of cigarettes daily for 40 years. He lives in the southwestern USA and works as a long-distance truck driver. Vital signs are within normal limits. A photograph of the left leg is shown. The left ankle brachial index is 0.75 (N>1). The remainder of the examination shows no abnormalities. Which of the following is the most likely cause of these findings?

A) Brown recluse spider bite
B) Malignant melanoma
C) Peripheral artery disease
D) Squamous cell carcinoma
E) Venous insufficiency

Correct Answer: E.

Venous insufficiency is a common cause of nonhealing ulcers on the lower extremities. In a healthy vascular system, return of venous blood from the legs is aided by muscle contraction which acts as a mechanical pump, along with valves preventing retrograde flow of blood. Diminished lower extremity muscle contraction, such as in individuals who sit or stand for prolonged periods of time (eg, truck drivers, as in this example), results in chronically increased venous pressure (venous hypertension) leading to compromise of the valve structures. Any source of venous obstruction may initiate this cycle (eg, chronic thrombosis). Over time, venous insufficiency occurs

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Incorrect Answers: A, B, C, and D.

Brown recluse spider bites (Choice A) occasionally cause necrotic skin lesions with an eschar, which then ulcerate over a 24 to 48-hour period. Systemic symptoms including fever, chills, fatigue, nausea, or vomiting may also be seen. Even without treatment, after approximately 10 days, lesions stop increasing in size and heal slowly by secondary intention. A brown recluse spider bite does not cause a chronic, nonhealing ulcer except in rare cases, though they can require months to heal.

Malignant melanoma (Choice B) is likely to be present when a lesion demonstrates asymmetry, irregular appearing borders, variable coloration, a diameter greater than 6 mm, and rapid evolution in characteristics. Ulceration is possible but is a secondary finding in addition to the primary lesion, which is absent in this case.

Peripheral artery disease (Choice C) is an abnormally diminished flow of blood to the extremities, which carries the potential for ischemia and necrosis of the extremity. In peripheral arterial disease, nonhealing ulcers tend to occur at the sites most distal from the blood supply and thus the most susceptible to ischemia, such as the distal digits. Venous insufficiency and peripheral arterial disease often occur simultaneously, as suggested in this patient by the abnormal left ankle brachial index. However, the

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Squamous cell carcinoma (Choice D) may develop within a chronic nonhealing ulcer but is not typically the cause of the ulcer. Basal cell carcinoma is more likely to ulcerate than squamous cell carcinoma.

Educational Objective: Venous insufficiency is a common cause of nonhealing ulcers on the lower extremities. Clinical manifestations include leg swelling, leg heaviness, venous varicosities, venous ulcers, and bronze discoloration of the leg. Venous ulcers will heal only when the underlying venous insufficiency is addressed.

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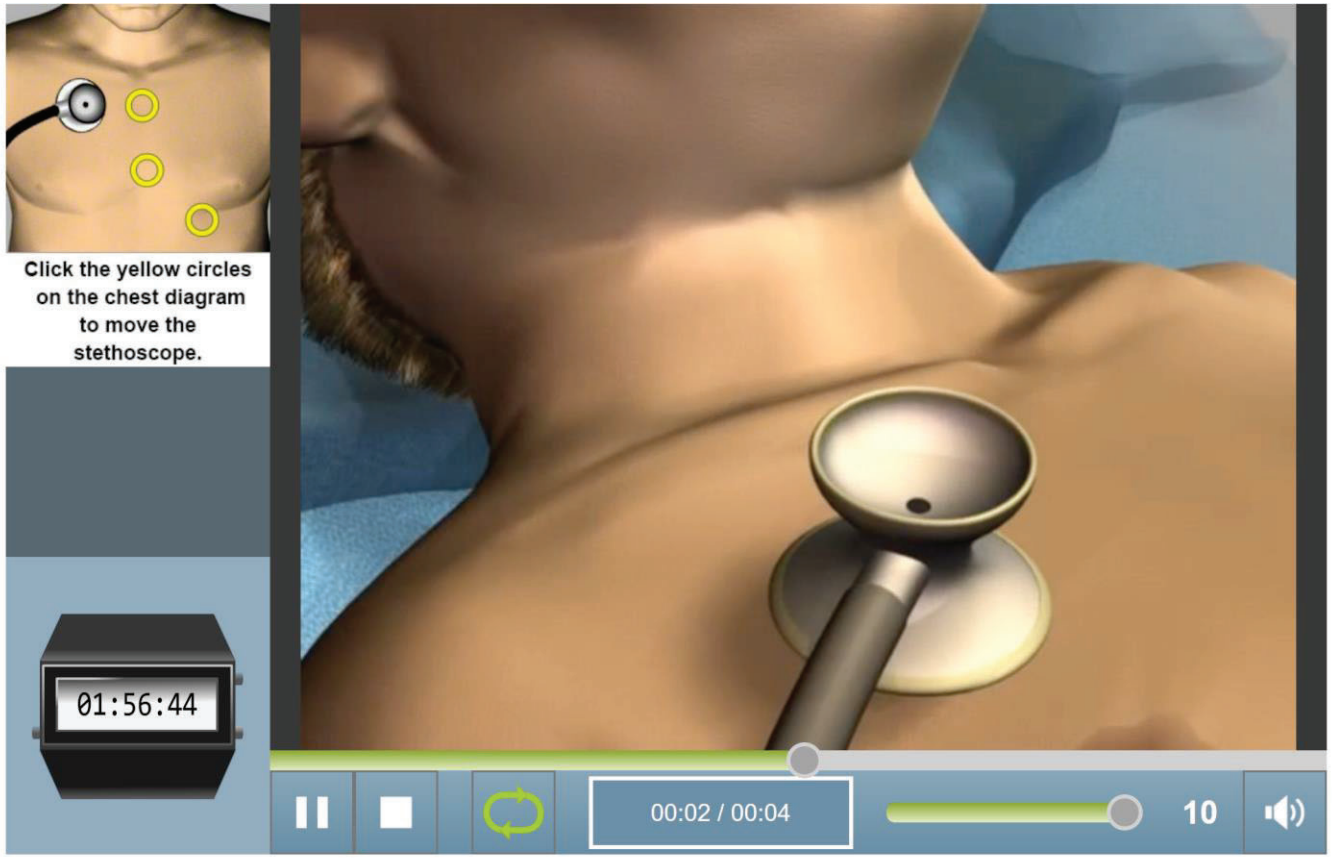

25. A previously healthy 4-year-old boy is brought to the physician because of a 3-day history of fever, cough, and runny nose. He has not had wheezing, vomiting, or diarrhea. He is at the 75th percentile for height and 10th percentile for weight. His temperature is 37.5°C (99.5°F). The skin is warm and pink. Capillary refill time is 2 seconds. Examination shows clear rhinorrhea. Breath sounds are normal. Cardiac examination is shown. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

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A) Congestive heart failure
B) Idiopathic pulmonary hypertension
C) Pericarditis
D) Upper respiratory tract infection
E) Ventricular septal defect

Correct Answer: D.

Many children will experience multiple benign, viral upper respiratory tract infections each year in infancy and childhood. Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Systemic symptoms such as chills, myalgias, arthralgias, and fatigue may occur as with any viral syndrome. The patient in this example presents with signs of a viral upper respiratory tract infection without any evidence of significant or serious bacterial infection (eg, pneumonia). Treatment includes supportive care, as most cases are self-limited and without complication, though parents should observe for persistent fevers, productive cough, or ear pain or discharge, as these may be signs of progression to pneumonia or acute otitis media. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation; these can be distinguished from pulmonary or cardiac sounds by listening with one earpiece of the stethoscope, permitting one-sided chest auscultation and correlation with external, ambient breath sounds from the patient in the non-auscultating ear.

Incorrect Answers: A, B, C, and E.

Congestive heart failure (Choice A) is uncommon in children apart from in cases of congenital heart disease. It generally presents with cough and shortness of breath (when left-sided) and with edema, hepatomegaly, or jugular venous distention (JVD) (when right-sided). Murmurs may be present on auscultation

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Idiopathic pulmonary hypertension (Choice B) generally presents with shortness of breath, chest discomfort on exertion, and signs of right-sided heart failure (eg, edema, hepatomegaly, JVD). Pulmonic or tricuspid murmurs may be heard, especially a loud P_2, and tricuspid regurgitation.

Pericarditis (Choice C) presents with central chest discomfort that often follows a viral infection. Pain is generally worse when supine and improved when upright; a friction rub is classically heard on auscultation.

Ventricular septal defect (Choice E) presents with a holosystolic murmur located at the midsternal area on the left. They are often asymptomatic and incidentally present in an estimated 1 to 2% of newborns, often spontaneously closing over the first years of life.

Educational Objective: Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation. These should be distinguished from rhonchi, rales, wheezes, and murmurs, friction rubs or gallops.

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26. An asymptomatic 37-year-old man who has been HIV positive for 1 year comes to the physician for a follow-up examination. His CD4+ T-lymphocyte count is 650/mm^3 (Normal≥500). A PPD skin test produces 6 mm of induration at 48 hours. An x-ray of the chest shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Repeat PPD skin test in 10 weeks
B) Repeat PPD skin test in 1 year
C) Second strength PPD skin test (250 tuberculin units) now
D) Treatment of active tuberculosis now
E) Treatment of latent tuberculosis now
F) No further testing or therapy

Correct Answer: E.

Treatment of latent tuberculosis now is the most appropriate next step in management. Latent tuberculosis infection (LTBI) is defined as a positive PPD skin test or interferon gamma release assay (IGRA) in the absence of active pulmonary or disseminated infection with *Mycobacterium tuberculosis* (MTB). Risk factors for exposure to MTB include residence in a region of the world where it is endemic, employment as a healthcare worker, or residence in prisons or homeless shelters. The PPD skin test is considered positive at varying sizes of induration based upon the population in which the test is done. Patients with HIV are considered to have a positive PPD skin test if the induration is measured at or above 5 mm. Other populations in which this degree of induration is considered positive are those with a known recent exposure to someone with active MTB infection or those who are immunosuppressed or immunocompromised for other reasons. Importantly, patients with HIV and a CD4+ T-lymphocyte count below 200 cells/mm^3 may initially have a negative test, so they should be re-tested when the CD4+ T-lymphocyte count is above 200 cells/mm^3. Active infection should be excluded with chest x-ray prior to initiating therapy for LTBI. Treatment regimens vary, but a common regimen consists of 9 months of isoniazid therapy.

Incorrect Answers: A, B, C, D, and F.

Repeat PPD skin test in 10 weeks (Choice A) is incorrect. This patient's degree of induration exceeds 5 mm at 48 hours and is considered positive.

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F) No further testing or therapy

Correct Answer: E.

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Incorrect Answers: A, B, C, D, and F.

Repeat PPD skin test in 10 weeks (Choice A) is incorrect. This patient's degree of induration exceeds 5 mm at 48 hours and is considered positive.

Repeat PPD skin test in 1 year (Choice B) is incorrect. This patient must be treated for LTBI now after excluding active MTB infection.

Second strength PPD skin test (250 tuberculin units) now (Choice C) is incorrect. This patient had a positive test on the standard PPD and warrants treatment.

Treatment of active tuberculosis now (Choice D) is incorrect. This patient has a normal chest x-ray and no clinical symptoms suggestive of pulmonary or disseminated MTB infection.

No further testing or therapy (Choice F) is incorrect. This patient is at a higher risk than the general population of reactivation of LTBI and warrants treatment.

Educational Objective: Patients with HIV are considered to have a positive PPD test if skin induration at 48 hours measures 5 mm or more. Following exclusion of active pulmonary MTB infection with a chest x-ray, all patients with HIV and a positive PPD skin test should be treated for LTBI.

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27. An 18-year-old woman is admitted to the hospital because of a 3-day history of fever, shortness of breath, and cough productive of sputum. She received the diagnosis of asthma at the age of 12 years. She is currently in acute respiratory distress. Her temperature is 37.3°C (99.1°F), pulse is 120/min, respirations are 30/min, and blood pressure is 120/70 mm Hg. Pulse oximetry on 4 L/min of oxygen by nasal cannula shows a decrease in oxygen saturation from 98% on admission to 90%. Examination shows use of accessory muscles of respiration. Breath sounds are decreased bilaterally. Her leukocyte count is 18,000/mm^3. A chest x-ray shows hyperinflation, which is consistent with x-ray findings on admission. Which of the following is the most likely cause of this patient's current condition?

A) Aspiration
B) Bronchospasm
C) Pneumonia
D) Pneumothorax
E) Pulmonary edema
F) Pulmonary embolus

Correct Answer: B.

The patient is likely experiencing an asthma exacerbation with severe respiratory distress driven by bronchospasm. Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. Patients present with episodes of wheezing, dry cough, and dyspnea. Physical examination often shows tachycardia, tachypnea, diffuse wheezes (rhonchi), and prolonged expiration relative to inspiration. As respiratory distress progresses, decreased air movement may lead to decreased breath sounds and an absence of wheezes. Chest x-rays are typically normal but may display hyperinflation because of airway obstruction and air trapping. Viral upper respiratory tract infection is a common trigger of acute asthma exacerbation, especially in the pediatric population. Acute management includes supplemental oxygen, inhaled short-acting β-adrenergicagonists, and systemic corticosteroids.

Incorrect Answers: A, C, D, E, and F.

Aspiration (Choice A) and pneumonia (Choice C) are important differential diagnoses to consider in a patient presenting with fever, dyspnea, and productive cough. Chest

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E) Pulmonary edema

F) Pulmonary embolus

Correct Answer: B.

The patient is likely experiencing an asthma exacerbation with severe respiratory distress driven by bronchospasm. Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. Patients present with episodes of wheezing, dry cough, and dyspnea. Physical examination often shows tachycardia, tachypnea, diffuse wheezes (rhonchi), and prolonged expiration relative to inspiration. As respiratory distress progresses, decreased air movement may lead to decreased breath sounds and an absence of wheezes. Chest x-rays are typically normal but may display hyperinflation because of airway obstruction and air trapping. Viral upper respiratory tract infection is a common trigger of acute asthma exacerbation, especially in the pediatric population. Acute management includes supplemental oxygen, inhaled short-acting β-adrenergicagonists, and systemic corticosteroids.

Incorrect Answers: A, C, D, E, and F.

Aspiration (Choice A) and pneumonia (Choice C) are important differential diagnoses to consider in a patient presenting with fever, dyspnea, and productive cough. Chest imaging typically discloses a consolidation.

Pneumothorax (Choice D) typically presents with chest pain and tachypnea with diminished breath sounds and hyperresonance to percussion on the affected side.

Pulmonary edema (Choice E) typically presents with crackles on pulmonary auscultation and a diffuse infiltrate on chest imaging, often with the associated finding of vascular congestion and cephalization.

Pulmonary embolus (Choice F) is important to consider in a patient presenting with dyspnea and respiratory distress. It is less likely in an otherwise healthy 18-year-old patient with known asthma who does not have a family history of unprovoked thromboembolic disease or recent risk factors for a provoked event.

Educational Objective: Bronchospasm in acute asthma exacerbation can often be triggered by viral upper respiratory infections, and it typically presents with shortness of breath, tachycardia, tachypnea, hypoxemia, poor air movement, wheezing, and accessory muscle use. Wheezes may be absent if air movement is significantly diminished. Chest imaging is generally normal, though it may show hyperinflation because of air trapping.

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28. A 51-year-old man comes to the physician because of a 1-year history of restless sleep and fatigue in the morning. He says that his wife has asked him to sleep in a separate bedroom because of his excessive snoring during this time. The patient has no history of serious illness and takes no medications. He is 191 cm (6 ft 3 in) tall and weighs 124 kg (273 lb); BMI is 34 kg/m^2. His pulse is 82/min, respirations are 16/min, and blood pressure is 150/90 mm Hg. Pulmonary examination shows no abnormalities. On cardiac examination, a loud S_2 is heard at the second left intercostal space. Which of the following is most likely to be seen on echocardiography?

A) Decreased left ventricular ejection fraction
B) Decreased right ventricular ejection fraction
C) Increased pulmonary artery pressure
D) Increased pulmonary venous pressure
E) Left atrial hypertrophy
F) Right atrial hypertrophy

Correct Answer: C.

Obstructive sleep apnea (OSA) is a common disorder characterized by repetitive episodes of breathing cessation (apnea) during sleep. Apneic events typically last for more than 10 seconds and can result in significant sleep disturbance. Risk factors for OSA include an increased age, obesity, and male gender, along with associated conditions such as hypothyroidism, acromegaly, and Down syndrome. The risk of OSA can be calculated using the STOP-BANG score, which assesses for the presence of patient snoring, feeling tired/fatigued, daytime sleepiness, observance of breathing cessation during sleep, high systemic blood pressure, BMI > 35, age >50, neck circumference >40 cm, and male gender, all of which are risk factors for OSA. The episodic hypoxia and hypercapnia associated with apneic episodes results in hypoxic pulmonary vasoconstriction and an overall increase in sympathetic tone. This leads to the subsequent development of both systemic and pulmonary arterial hypertension if the patient's OSA goes untreated or is severe. This patient presents with symptoms consistent with OSA, and his physical examination demonstrates a loud S_2, which likely indicates the presence of increased pulmonary artery pressure causing the hyperdynamic closure of the pulmonic valve, consistent with pulmonary arterial hypertension.

Incorrect Answers: A, B, D, E, and F.

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conditions such as hypothyroidism, acromegaly, and Down syndrome. The risk of OSA can be calculated using the STOP-BANG score, which assesses for the presence of patient snoring, feeling tired/fatigued, daytime sleepiness, observance of breathing cessation during sleep, high systemic blood pressure, BMI > 35, age >50, neck circumference >40 cm, and male gender, all of which are risk factors for OSA. The episodic hypoxia and hypercapnia associated with apneic episodes results in hypoxic pulmonary vasoconstriction and an overall increase in sympathetic tone. This leads to the subsequent development of both systemic and pulmonary arterial hypertension if the patient's OSA goes untreated or is severe. This patient presents with symptoms consistent with OSA, and his physical examination demonstrates a loud S_2, which likely indicates the presence of increased pulmonary artery pressure causing the hyperdynamic closure of the pulmonic valve, consistent with pulmonary arterial hypertension.

Incorrect Answers: A, B, D, E, and F.

Decreased left ventricular ejection fraction (Choice A) is characteristic of systolic heart failure or cardiogenic shock. While heart failure can be a potential sequela of chronic systemic hypertension from untreated, chronic OSA, this patient demonstrates no signs or symptoms of congestive heart failure and has only demonstrated features concerning for OSA over the last year.

Decreased right ventricular ejection fraction (Choice B) would be consistent with right ventricular heart failure. This may also be a potential sequela of untreated, chronic OSA, as increased pulmonary arterial pressures result in increased right-sided afterload, which can consequently result in right ventricular remodeling and heart failure (eg, cor pulmonale). This patient demonstrates no symptoms of right heart failure.

Increased pulmonary venous pressure (Choice D) occurs in the setting of left heart failure or severe mitral regurgitation with associated left atrial dilatation. This is the most common cause of right heart failure, as increased pulmonary venous pressure can be transmitted to the pulmonary arterial system and subsequently exert deleterious effects on the right ventricle. This patient demonstrates no signs or symptoms of left ventricular heart failure or mitral regurgitation.

Left atrial hypertrophy (Choice E) and right atrial hypertrophy (Choice F) are less common cardiac findings, although may be seen in the setting of mitral or tricuspid pathology (eg, stenosis or regurgitation), respectively. This patient's cardiac examination demonstrates no signs suggestive of either murmur.

Educational Objective: Obstructive sleep apnea is characterized by repetitive episodes of breathing cessation during sleep, which results in significant sleep disturbance. Patients often present with severe fatigue, tiredness, and daytime sleepiness, along with risk factors such as obesity, male gender, and a large neck circumference. OSA, if untreated, can result in consequent systemic and pulmonary arterial hypertension.

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29. A 77-year-old man comes to the office because of a 1-day history of bloody diarrhea and moderate abdominal pain. He has had a decreased appetite and four to five bloody stools daily during this period. He was discharged from the hospital 1 week ago following management of an anterior wall myocardial infarction. He has not had fever, chills, vomiting, or recent exposure to sick contacts since he left the hospital. He has not traveled outside of the USA during the past year. His medications are enalapril, atorvastatin, metoprolol, and daily aspirin. He appears moderately ill. His pulse is 95/min, and blood pressure is 105/72 mm Hg. Cardiac examination shows a grade 2/6 systolic ejection murmur. Abdominal examination shows diffuse tenderness that is most prominent in the left lower quadrant; there is voluntary guarding but no rebound tenderness, and no masses are palpated. Results of laboratory studies are shown:

Hematocrit	39%
Leukocyte count	12,000/mm^3
Platelet count	175,000/mm^3
Serum	
Na^+	139 mEq/L
K^+	3.9 mEq/L
Cl^-	106 mEq/L
HCO_3^-	22 mEq/L
Urea nitrogen	29 mg/dL
Creatinine	1.2 mg/dL
Fecal leukocytes	0/mm^3

Which of the following is the most likely diagnosis?

A) Angiodysplasia
B) Colon cancer
C) Cytomegalovirus proctitis
D) Diverticulitis
E) *Escherichia coli* O157:H7 infection

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Creatinine	1.2 mg/dL
Fecal leukocytes	0/mm^3

Which of the following is the most likely diagnosis?

A) Angiodysplasia
B) Colon cancer
C) Cytomegalovirus proctitis
D) Diverticulitis
E) *Escherichia coli* O157:H7 infection
F) Ischemic colitis

Correct Answer: F.

Ischemic colitis describes insufficient blood flow and delivery of oxygen and nutrients to an area of the intestine and should be suspected in a patient with abdominal pain and hematochezia/melena. This most commonly occurs in the setting of atherosclerosis, in hypercoagulable states with emboli such as atrial fibrillation or mural thrombus (potentially in this case), or in a watershed region when it occurs following systemic hypotension (possible in this case as a result of potential cardiogenic shock). Risk factors for acute ischemic colitis include older age, coronary artery disease, hypercoagulability, and peripheral arterial disease. Typical symptoms of patients with acute ischemic colitis include crampy abdominal pain, tenderness over the affected bowel, and hematochezia. Ischemic colitis can be complicated by necrosis, viscus perforation, or ileus. Treatment typically involves supportive care, anticoagulation, thrombectomy, antibiotics, and surgery in cases of bowel infarction, necrosis, or perforation. Severe cases can be fatal.

Incorrect Answers: A, B, C, D, and E.

Angiodysplasia (Choice A) is a common disorder found in older adults and patients with hereditary defects of blood vessel growth and formation (eg, hereditary hemorrhagic telangiectasia). The major complication is blood loss and anemia. Acute abdominal pain in the setting of a recent myocardial infarction is more suggestive of ischemic colitis.

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Ischemic colitis describes insufficient blood flow and delivery of oxygen and nutrients to an area of the intestine and should be suspected in a patient with abdominal pain and hematochezia/melena. This most commonly occurs in the setting of atherosclerosis, in hypercoagulable states with emboli such as atrial fibrillation or mural thrombus (potentially in this case), or in a watershed region when it occurs following systemic hypotension (possible in this case as a result of potential cardiogenic shock). Risk factors for acute ischemic colitis include older age, coronary artery disease, hypercoagulability, and peripheral arterial disease. Typical symptoms of patients with acute ischemic colitis include crampy abdominal pain, tenderness over the affected bowel, and hematochezia. Ischemic colitis can be complicated by necrosis, viscus perforation, or ileus. Treatment typically involves supportive care, anticoagulation, thrombectomy, antibiotics, and surgery in cases of bowel infarction, necrosis, or perforation. Severe cases can be fatal.

Incorrect Answers: A, B, C, D, and E.

Angiodysplasia (Choice A) is a common disorder found in older adults and patients with hereditary defects of blood vessel growth and formation (eg, hereditary hemorrhagic telangiectasia). The major complication is blood loss and anemia. Acute abdominal pain in the setting of a recent myocardial infarction is more suggestive of ischemic colitis.

Colon cancer (Choice B) commonly presents with partial obstruction of the bowel lumen, change in stool caliber, chronic blood loss, iron deficiency anemia, and weight loss. The acute onset and short duration of symptoms are less supportive of this diagnosis.

Cytomegalovirus proctitis (Choice C) typically presents with rectal bleeding, pain, and a systemic mononucleosis-like syndrome. It is more common in patients who are immunocompromised and engage in receptive anal intercourse.

Diverticulitis (Choice D) is a bacterial infection of a diverticulum that leads to a local inflammatory response and classically presents with fever and lower left quadrant abdominal pain. Bloody diarrhea is a less frequent symptom.

Escherichia coli O157:H7 infection (Choice E) is associated with bloody diarrhea and hemolytic uremic syndrome, which typically presents in children with bloody diarrhea, microangiopathic hemolytic anemia, thrombocytopenia, and renal failure.

Educational Objective: Ischemic colitis describes insufficient blood supply to an area of the bowel and should be suspected in a patient with acute abdominal pain and hematochezia, especially in the setting of a recent possible prolonged episode of hypotension or embolism.

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30. A 46-year-old woman, gravida 3, para 3, comes to the emergency department because of a 4-day history of "crampy" lower abdominal pain. She voids six times daily and once at night. Her last bowel movement was 3 days ago. She has not had fever, nausea, vomiting, or changes in appetite. She has hypertension, hypothyroidism, chronic back pain, and overactive bladder. Medications are enalapril, levothyroxine, tramadol, mirabegron, and acetaminophen. She is sexually active with her husband. She appears mildly uncomfortable. Temperature is 37.5°C (99.5°F), pulse is 64/min, respirations are 12/min, and blood pressure is 132/86 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. No abdominal tenderness in noted. The remainder of the examination shows no abnormalities. Adverse effect of which of the following is the most likely cause of this patient's presenting symptom?

A) Acetaminophen
B) Enalapril
C) Levothyroxine
D) Mirabegron
E) Tramadol

Correct Answer: E.

This patient with lower abdominal pain and lack of a bowel movement for several days is likely suffering from opioid-induced constipation. Tramadol is an opioid agonist with effects on serotonin and norepinephrine reuptake as well. Opioid analgesics in general act throughout the central, peripheral, and enteric nervous systems. Common adverse effects include euphoria (caused by interaction with dopamine), altered mental status, sedation (in severe cases manifesting as a decreased Glasgow Coma Score), bradycardia, hypotension, depressed respiratory drive, constricted pupils, decreased gut motility, and constipation. Management involves a decrease in dose or cessation of the medication, adequate oral hydration, stool softeners and laxatives, and opioid antagonists for refractory cases.

Incorrect Answers: A, B, C, and D.

Acetaminophen (Choice A) is generally well-tolerated with few adverse effects. Acute overdose can result in fulminant liver failure, and chronic use is associated with analgesic nephropathy. It is not associated with constipation.

Enalapril (Choice B) is an ACE inhibitor with common adverse effects of dry cough, hypotension, and renal dysfunction.

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B) Enalapril
C) Levothyroxine
D) Mirabegron
E) Tramadol

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Acetaminophen (Choice A) is generally well-tolerated with few adverse effects. Acute overdose can result in fulminant liver failure, and chronic use is associated with analgesic nephropathy. It is not associated with constipation.

Enalapril (Choice B) is an ACE inhibitor, with common adverse effects of dry cough, hypotension, and renal dysfunction.

Common adverse effects of levothyroxine (Choice C) include diarrhea, gastrointestinal upset, tremor, palpitations, increased appetite, and insomnia.

Mirabegron (Choice D) is a β_3-adrenergic receptor agonist commonly used to treat overactive bladder. Adverse effects include hypertension, tachycardia, diarrhea, constipation, and abdominal pain. Opioid analgesics have a stronger association with constipation.

Educational Objective: Common adverse effects of opioid analgesics include euphoria, altered mental status, sedation, bradycardia, hypotension, depressed respiratory drive, constricted pupils, decreased gut motility, and constipation.

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31. A 69-year-old woman comes to the physician because of a 6-day history of blood in her urine. She has not had pain. She has no history of serious illness and takes no medications. Vital signs are within normal limits. Examination shows no abnormalities. Urinalysis shows many RBCs. Cystoscopy shows a 2-cm mass in the bladder. Which of the following is the most likely diagnosis?

A) Bladder polyp
B) Leiomyosarcoma
C) Papilloma
D) Transitional cell carcinoma
E) Vesicle calculus

Correct Answer: D.

Transitional cell carcinoma, also known as urothelial cell carcinoma, is a malignancy affecting the urinary tract epithelium. It can develop in the renal collecting tubules, calyx, renal pelvis, ureter, urethra, or bladder, since all of these structures share the same embryologic origin and epithelial cell type. It typically presents with painless gross hematuria. Some affected individuals remain asymptomatic until an advanced stage of disease and therefore present with a worse prognosis. Ureteral obstruction occurs in many patients at the site of the primary tumor or in noncontiguous areas with drop metastases. Cigarette smoking is a strong risk factor for transitional cell carcinoma of the urinary tract. Carcinogens known to be associated with urothelial cancer include phenacetin, cyclophosphamide, and 2-naphthylamine. Carcinogens are excreted in the urine, thereby causing exposure to the mucosal surfaces of the upper and lower urinary tract. Treatment is based on the stage of cancer but typically involves partial or complete removal of the affected kidney, ureter, or part of the bladder.

Incorrect Answers: A, B, C, and E.

Benign bladder polyp (Choice A) is a rare cause of hematuria. Masses observed in the bladder are more likely to be malignancy.

Leiomyosarcoma (Choice B) is a cancer of smooth muscle cells and most commonly occurs in the abdomen or uterus. It typically presents with abnormal uterine bleeding in women who are postmenopausal.

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D) Transitional cell carcinoma

E) Vesicle calculus

Correct Answer: D.

Transitional cell carcinoma, also known as urothelial cell carcinoma, is a malignancy affecting the urinary tract epithelium. It can develop in the renal collecting tubules, calyx, renal pelvis, ureter, urethra, or bladder, since all of these structures share the same embryologic origin and epithelial cell type. It typically presents with painless gross hematuria. Some affected individuals remain asymptomatic until an advanced stage of disease and therefore present with a worse prognosis. Ureteral obstruction occurs in many patients at the site of the primary tumor or in noncontiguous areas with drop metastases. Cigarette smoking is a strong risk factor for transitional cell carcinoma of the urinary tract. Carcinogens known to be associated with urothelial cancer include phenacetin, cyclophosphamide, and 2-naphthylamine. Carcinogens are excreted in the urine, thereby causing exposure to the mucosal surfaces of the upper and lower urinary tract. Treatment is based on the stage of cancer but typically involves partial or complete removal of the affected kidney, ureter, or part of the bladder.

Incorrect Answers: A, B, C, and E.

Benign bladder polyp (Choice A) is a rare cause of hematuria. Masses observed in the bladder are more likely to be malignancy.

Leiomyosarcoma (Choice B) is a cancer of smooth muscle cells and most commonly occurs in the abdomen or uterus. It typically presents with abnormal uterine bleeding in women who are postmenopausal.

Urothelial papilloma (Choice C) is an uncommon, benign neoplasm that arises from the bladder urothelium. They tend to develop close to the ureteric orifices and the urethra and may result in urinary obstruction.

A vesicle calculus (Choice E), or bladder calculus, can form from stagnant urine, renal calculi that have passed through the ureters, or the presence of foreign materials, such as an indwelling urinary catheter. They may present with dysuria or hematuria and can be a nidus for infection.

Educational Objective: Transitional cell carcinoma is the most common tumor of the urinary tract system and typically presents with painless gross hematuria. It is associated with smoking, aniline dyes, and cyclophosphamide.

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32. An 18-year-old man is brought to the emergency department because of severe pelvic and lower abdominal pain 30 minutes after he was involved in a motorcycle collision in which he struck a parked car. He was wearing a helmet and did not have loss of consciousness. He is alert. His pulse is 120/min, respirations are 18/min, and blood pressure is 130/50 mm Hg. The airway is clear and open, and breath sounds are normal. The abdomen is nontender. There are ecchymoses over the pelvis and scrotum. The pelvis is unstable. There is blood at the urethral meatus. Pulses are 2+ in all extremities. An x-ray of the pelvis shows an anteroposterior compression fracture. A pelvic binder is placed. Which of the following is the most appropriate next step in management of this patient's urinary tract injury?

A) CT scan of the abdomen and pelvis
B) Cystography
C) Placement of a urinary catheter
D) Pyelography
E) Retrograde urethrography

Correct Answer: E.

Urethral injury can occur secondary to blunt trauma and typically presents with blood at the meatus, ecchymoses of the pelvis and scrotum, pelvic fracture (presenting as pelvic instability in this patient), difficulty voiding, and a high-riding prostate. The diagnosis is evaluated by retrograde urethrography (RUG), which involves the injection of contrast directly into the urethra and typically demonstrates extravasation of contrast from the urethra in cases of urethral injury. The results of RUG determine the next acute management steps. Acute management involves decompression of the bladder, which commonly occurs via urethral catheterization (though it must occur via suprapubic catheterization in the case of complete urethral injury). Immediate surgical exploration and repair are indicated in severe cases.

Incorrect Answers: A, B, C, and D.

CT scan of the abdomen and pelvis (Choice A) will assist in evaluating the suspected pelvic fracture but not in management of the urinary tract injury. Generally, urethral trauma is not well visualized on CT scan.

Cystography (Choice B), involving the injection of contrast into the bladder via urinary catheter, is commonly utilized to evaluate suspected traumatic bladder injury.

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D) Pyelography

E) Retrograde urethrography

Correct Answer: E.

Urethral injury can occur secondary to blunt trauma and typically presents with blood at the meatus, ecchymoses of the pelvis and scrotum, pelvic fracture (presenting as pelvic instability in this patient), difficulty voiding, and a high-riding prostate. The diagnosis is evaluated by retrograde urethrography (RUG), which involves the injection of contrast directly into the urethra and typically demonstrates extravasation of contrast from the urethra in cases of urethral injury. The results of RUG determine the next acute management steps. Acute management involves decompression of the bladder, which commonly occurs via urethral catheterization (though it must occur via suprapubic catheterization in the case of complete urethral injury). Immediate surgical exploration and repair are indicated in severe cases.

Incorrect Answers: A, B, C, and D.

CT scan of the abdomen and pelvis (Choice A) will assist in evaluating the suspected pelvic fracture but not in management of the urinary tract injury. Generally, urethral trauma is not well visualized on CT scan.

Cystography (Choice B), involving the injection of contrast into the bladder via urinary catheter, is commonly utilized to evaluate suspected traumatic bladder injury. Bladder injury commonly presents with gross hematuria rather than blood at the meatus. Urethral injury generally needs to be excluded before cystography.

Placement of a urinary catheter (Choice C) may be indicated if complete urethral injury is not present on RUG. However, the injury should be diagnosed and characterized by RUG to determine the type of catheterization that is indicated. Placing a catheter through a urethral defect can worsen trauma and injure adjacent structures.

Pyelography (Choice D) involves the intravenous injection of radio-opaque contrast to visualize the renal collecting system, ureters, and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures. It is not commonly used to investigate traumatic injuries of the urethra.

Educational Objective: Urethral injury typically presents with blood at the meatus, ecchymoses of the pelvis and scrotum, pelvic fracture, difficulty voiding, and a high-riding prostate. The diagnosis is confirmed and graded by retrograde urethrography before bladder decompression and/or surgical intervention are performed.

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33. A 27-year-old woman, gravida 2, para 1, at 14 weeks' gestation comes to the physician for her first prenatal visit. She is concerned because 2 years ago, during her first pregnancy, she delivered a stillborn at 38 weeks' gestation 24 hours after she had noticed decreased fetal movement. She has no history of serious illness. Examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Monthly 1-hour glucose tolerance tests
B) Nonstress testing in the third trimester
C) Fetal Doppler ultrasonography at 36 weeks' gestation
D) Amniocentesis for karyotype analysis
E) Cesarean delivery at 37 weeks' gestation

Correct Answer: B.

Antepartum intrauterine fetal demise commonly presents with decreased fetal movement and lack of fetal heart tones on examination. Ultrasonography confirms the lack of fetal cardiac activity and intrauterine fetal demise. In high-income countries, stillbirth (fetal loss after 20 weeks' gestation) is most commonly cause by chromosomal abnormalities, uteroplacental insufficiency, and maternal medical disease, whereas it is more commonly caused by maternal infection, preeclampsia, or obstructed labor in low-income countries. Other causes include hydrops fetalis, placental abruption, fetal arrhythmia, umbilical cord compression, and fetomaternal hemorrhage. Common evaluation at the time of fetal demise includes a fetal autopsy and placental examination, complete blood count, fasting blood glucose, urine drug screen, a type and screen, Kleihauer-Betke test, and genetic testing, although this varies based on the patient and health care system. Risk factors include a previous fetal demise, African American race, extremes of reproductive age, multiple gestations, and assisted reproduction. Patients with previous antepartum fetal demise must be carefully monitored during their pregnancy to prevent recurrence. In addition to ruling out complicating medical conditions, they should receive two to three ultrasounds across the gestation to determine age, congenital anomalies, and amniotic fluid volume, along with routine monitoring of fetal growth. Additionally, women with an unexplained late-term stillbirth at greater than 32 weeks' gestation, as in this patient, should undergo weekly nonstress testing in the third trimester starting at 32 weeks' gestation.

Incorrect Answers: A, C, D, and E.

Monthly 1-hour glucose tolerance tests (Choice A) would allow for the evaluation of maternal diabetes mellitus, which can contribute to fetal congenital abnormalities and

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low-income countries. Other causes include hydrops fetalis, placental abruption, fetal arrhythmia, umbilical cord compression, and fetomaternal hemorrhage. Common evaluation at the time of fetal demise includes a fetal autopsy and placental examination, complete blood count, fasting blood glucose, urine drug screen, a type and screen, Kleihauer-Betke test, and genetic testing, although this varies based on the patient and health care system. Risk factors include a previous fetal demise, African American race, extremes of reproductive age, multiple gestations, and assisted reproduction. Patients with previous antepartum fetal demise must be carefully monitored during their pregnancy to prevent recurrence. In addition to ruling out complicating medical conditions, they should receive two to three ultrasounds across the gestation to determine age, congenital anomalies, and amniotic fluid volume, along with routine monitoring of fetal growth. Additionally, women with an unexplained late-term stillbirth at greater than 32 weeks' gestation, as in this patient, should undergo weekly nonstress testing in the third trimester starting at 32 weeks' gestation.

Incorrect Answers: A, C, D, and E.

Monthly 1-hour glucose tolerance tests (Choice A) would allow for the evaluation of maternal diabetes mellitus, which can contribute to fetal congenital abnormalities and demise. However, glucose tolerance testing is not typically recommended until between 24 and 28 weeks' gestation, unless the patient has risk factors for preexisting diabetes mellitus.

Fetal doppler ultrasonography at 36 weeks' gestation (Choice C) may provide information about the fetal growth and amniotic fluid volume. However, ultrasonography for that purpose is recommended to occur at 24 to 30 weeks' gestation, rather than at 36 weeks, as it will allow earlier detection of abnormal fetal growth patterns.

Amniocentesis for karyotype analysis (Choice D) may be warranted but is not recommended until 15 to 18 weeks' gestation, since performing the procedure earlier is associated with an increased risk for fetal loss. Additionally, it is often used as a confirmatory test following an abnormal quad screen for fetal abnormalities rather than as an initial diagnostic test.

Cesarean delivery at 37 weeks' gestation (Choice E) is not warranted. Delivery should not occur prior to 39 weeks' gestation for patients with a previous unexplained stillbirth and a current uncomplicated pregnancy.

Educational Objective: Antepartum fetal demise can be caused by a variety of factors, including chromosomal abnormalities, uteroplacental insufficiency, preeclampsia, infection, maternal medical disease, and placental abruption, among others. Risk factors include a prior fetal demise, African American race, extremes of reproductive age, and assisted reproduction. Patients with a previous intrauterine fetal demise should be screened for complicating medical conditions, have serial ultrasonography throughout the gestation, and undergo nonstress testing starting in the third trimester.

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34. A 25-year-old woman comes to the physician for a follow-up examination because she continues to have urinary frequency and pain with urination despite a 1-week course of trimethoprim-sulfamethoxazole followed by a 1-week course of nitrofurantoin. A urine culture at the onset of her symptoms 2 weeks ago showed vaginal flora but no specific organism. She is sexually active and uses an oral contraceptive. Examination shows a mildly erythematous, tender urethra. Purulent material can be expressed from the periurethral glands. Vaginal examination shows no abnormalities, and there is no vaginal discharge. Bimanual examination shows a nontender cervix and uterus. The cervix is friable and bleeds easily after a Pap smear. Which of the following is the most likely diagnosis?

A) Bartholin gland abscess
B) *Chlamydia trachomatis* infection
C) Interstitial cystitis
D) Pseudomonal urinary tract infection
E) Pyelonephritis
F) Urethral diverticulum

Correct Answer: B.

A patient with persistent symptoms of urethritis (eg, urinary frequency, urgency, and dysuria) despite adequate treatment for a urinary tract infection with trimethoprim-sulfamethoxazole raises concern for other causes of urethritis such as sexually transmitted infections secondary to *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Both organisms can cause vaginitis, cervicitis, and pelvic inflammatory disease. Vaginitis typically presents with mucopurulent discharge and pruritus. Cervicitis presents with similar discharge, but also with an erythematous, friable cervix and cervical motion tenderness on examination. When infection spreads to the fallopian tubes and ovaries, pelvic inflammatory disease (PID) can result, which presents with cervical motion tenderness, purulent cervical discharge, uterine and adnexal tenderness, and systemic signs and symptoms such as fever, fatigue, nausea, and myalgias. Complications include tubo-ovarian or intra-abdominal abscess. Gram stain of the urine or urethral/vaginal discharge typically does not disclose organisms, as *C. trachomatis* is an obligate intracellular organism. Diagnosis is made with a nucleic acid amplification test, and treatment consists of either azithromycin or doxycycline in combination with ceftriaxone, with the latter covering a potential *N. gonorrhoeae* coinfection.

Incorrect Answers: A, C, D, E, and F.

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sulfamethoxazole raises concern for other causes of urethritis such as sexually transmitted infections secondary to *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Both organisms can cause vaginitis, cervicitis, and pelvic inflammatory disease. Vaginitis typically presents with mucopurulent discharge and pruritus. Cervicitis presents with similar discharge, but also with an erythematous, friable cervix and cervical motion tenderness on examination. When infection spreads to the fallopian tubes and ovaries, pelvic inflammatory disease (PID) can result, which presents with cervical motion tenderness, purulent cervical discharge, uterine and adnexal tenderness, and systemic signs and symptoms such as fever, fatigue, nausea, and myalgias. Complications include tubo-ovarian or intra-abdominal abscess. Gram stain of the urine or urethral/vaginal discharge typically does not disclose organisms, as *C. trachomatis* is an obligate intracellular organism. Diagnosis is made with a nucleic acid amplification test, and treatment consists of either azithromycin or doxycycline in combination with ceftriaxone, with the latter covering a potential *N. gonorrhoeae* coinfection.

Incorrect Answers: A, C, D, E, and F.

Bartholin gland abscess (Choice A) typically originates as a fluctuant, swollen cyst caused by obstruction of gland outflow. If left untreated, a cyst can progress to an abscess, with the development of erythema and tenderness to palpation. The patient does not have a localized area of infection consistent with abscess on examination.

Interstitial cystitis (Choice C) is a poorly understood chronic inflammatory condition of the bladder that is not associated with a causative infectious organism. It typically presents with recurrent suprapubic pain that is relieved by voiding and increased urinary urgency and frequency.

Pseudomonal urinary tract infection (Choice D), or infection with other potentially antibiotic-resistant organisms, is an important consideration for a urinary tract infection that is refractory to standard empiric antibiotic courses. A repeat urinalysis and urine culture could be sent. The finding of a friable cervix and absence of growth on the original urine culture are more suggestive of *C. trachomatis* infection.

Pyelonephritis (Choice E) is a urinary tract infection that has spread to the kidneys, which is characterized by flank pain, fever and chills, nausea, vomiting, and costovertebral tenderness on physical examination.

Urethral diverticulum (Choice F) is an outpouching of the urethra that presents with recurrent urinary tract infections, urethritis, urinary incontinence, and incomplete bladder emptying. C. trachomatis infection is more common and associated with sexual activity and a friable cervix on examination.

Educational Objective: *C. trachomatis* infection is a sexually transmitted bacterium that can cause cervicitis, urethritis, epididymitis, and pelvic inflammatory disease. Treatment requires azithromycin or doxycycline in combination with ceftriaxone, the latter to cover a potential *N. gonorrhoeae* coinfection.

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35. A 37-year-old woman comes to the physician for a routine follow-up examination. She has a 12-year history of type 2 diabetes mellitus treated with glipizide and diet. She has urinary frequency when she does not follow her diet. She is otherwise healthy. There is no family history of diabetes mellitus. Her pulse is 72/min, and blood pressure is 130/80 mm Hg. Funduscopic examination shows scattered microaneurysms. The remainder of the examination shows no abnormalities. Which of the following is most likely to determine this patient's risk for diabetic nephropathy?

A) Measurement of hemoglobin A_{1c}
B) Measurement of serum albumin concentration
C) Measurement of serum glucose concentration
D) Measurement of urine microalbumin concentration
E) Measurement of urine protein by dipstick

Correct Answer: D.

Longstanding hyperglycemia such as that in diabetes mellitus can result in diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles. This results in thickening of the basement membrane along with compromise of the filtration barrier, which leads to an increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole also occurs, which can initially increase the glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson nodules, on biopsy. The combination of increased basement membrane permeability and initially increased GFR progresses over time in patients with diabetes mellitus, beginning as microalbuminuria, progressing to macroalbuminuria, and eventually to end-stage renal disease. Measurement of urine microalbumin concentration is the most sensitive test to detect albumin in the urine to determine the risk for developing diabetic nephropathy. ACE inhibitors can decrease the progression of diabetic nephropathy and are first-line.

Incorrect Answers: A, B, C, and E.

Measurement of hemoglobin A_{1c} (Choice A) reflects the average serum glucose (Choice C) over the past 3 months. It results from chronic increases in the blood glucose concentration leading to the production of glycated hemoglobin and can be used for the diagnosis and assessment of treatment efficacy for diabetes mellitus.

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C) Measurement of serum glucose concentration

D) Measurement of urine microalbumin concentration

E) Measurement of urine protein by dipstick

Correct Answer: D.

Longstanding hyperglycemia such as that in diabetes mellitus can result in diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles. This results in thickening of the basement membrane along with compromise of the filtration barrier, which leads to an increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole also occurs, which can initially increase the glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson nodules, on biopsy. The combination of increased basement membrane permeability and initially increased GFR progresses over time in patients with diabetes mellitus, beginning as microalbuminuria, progressing to macroalbuminuria, and eventually to end-stage renal disease. Measurement of urine microalbumin concentration is the most sensitive test to detect albumin in the urine to determine the risk for developing diabetic nephropathy. ACE inhibitors can decrease the progression of diabetic nephropathy and are first-line.

Incorrect Answers: A, B, C, and E.

Measurement of hemoglobin A_{1c} (Choice A) reflects the average serum glucose (Choice C) over the past 3 months. It results from chronic increases in the blood glucose concentration leading to the production of glycated hemoglobin and can be used for the diagnosis and assessment of treatment efficacy for diabetes mellitus.

Measurement of serum albumin concentration (Choice B) is not a sensitive or specific test for determining a patient's risk for diabetic nephropathy. Diabetic nephropathy results in chronic kidney injury and albumin leakage into urine, and thus measurement of urine microalbumin concentration is more sensitive and specific.

Measurement of urine protein by dipstick (Choice E) can detect the presence of albumin, but measurement of urine microalbumin concentration is a more quantitative and sensitive test to detect early diabetic nephropathy.

Educational Objective: Diabetic nephropathy leads to increased glomerular basement membrane permeability and initially increased GFR, resulting in microalbuminuria and potential progression to end-stage renal disease. Measurement of urine microalbumin concentration is the most sensitive test to detect albumin in the urine.

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36. Two months after successful resection of a benign adrenal pheochromocytoma, a 47-year-old man comes for a follow-up examination. He has had occasional episodes of mild diarrhea over the past 6 weeks but is otherwise well. There is a family history of endocrine tumors. His blood pressure is 100/60 mm Hg. Examination shows a 2-cm, firm nodule in the right lobe of the thyroid gland. Laboratory studies are most likely to show which of the following serum concentrations?

A) Decreased calcitonin
B) Decreased calcium
C) Decreased thyroid-stimulating hormone
D) Increased calcitonin
E) Increased calcium
F) Increased magnesium
G) Increased thyroid-stimulating hormone
H) Increased triiodothyronine (T_3)

Correct Answer: D.

In a patient with prior pheochromocytoma and family history of endocrine tumors, multiple endocrine neoplasia, type 2A or 2B (MEN IIA or IIB) is likely, which can present with pheochromocytoma and medullary thyroid carcinoma. Medullary thyroid carcinoma arises from parafollicular C cells and produces calcitonin. It often arises insidiously and is typically asymptomatic until a nodule is of palpable size. Symptoms of hypocalcemia may be present, if severe. It can spread hematogenously or lymphatically. Diagnosis occurs through thyroid ultrasonography and biopsy. Treatment includes thyroidectomy and chemoradiation. It generally does not cause symptoms of hyperthyroidism, though hypothyroidism may result post-thyroidectomy.

Incorrect Answers: A, B, C, E, F, G, and H.

Medullary thyroid carcinoma secretes calcitonin leading to increased, not decreased, calcitonin (Choice A) and can result in decreased serum calcium, not increased

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E) Increased calcium

F) Increased magnesium

G) Increased thyroid-stimulating hormone

H) Increased triiodothyronine (T_3)

Correct Answer: D.

In a patient with prior pheochromocytoma and family history of endocrine tumors, multiple endocrine neoplasia, type 2A or 2B (MEN IIA or IIB) is likely, which can present with pheochromocytoma and medullary thyroid carcinoma. Medullary thyroid carcinoma arises from parafollicular C cells and produces calcitonin. It often arises insidiously and is typically asymptomatic until a nodule is of palpable size. Symptoms of hypocalcemia may be present, if severe. It can spread hematogenously or lymphatically. Diagnosis occurs through thyroid ultrasonography and biopsy. Treatment includes thyroidectomy and chemoradiation. It generally does not cause symptoms of hyperthyroidism, though hypothyroidism may result post-thyroidectomy.

Incorrect Answers: A, B, C, E, F, G, and H.

Medullary thyroid carcinoma secretes calcitonin leading to increased, not decreased, calcitonin (Choice A) and can result in decreased serum calcium, not increased (Choice E). While calcitonin production can result in decreased calcium (Choice B), this is not always the case and hypocalcemia may be mild. Calcitonin is the most sensitive serum test for medullary thyroid carcinoma.

Decreased thyroid-stimulating hormone (TSH) (Choice C) and increased triiodothyronine (T_3) (Choice H) can be present in patients with primary hyperthyroidism. Patients with hyperthyroidism can present with heat intolerance, weight loss, tremor, hyperreflexia, and warm, moist skin. In contrast, increased TSH (Choice G) is measured in cases of primary hypothyroidism. Hypothyroidism can cause fatigue, decreased energy levels, cold intolerance, menorrhagia, hair loss, weight gain, or constipation.

Medullary thyroid carcinoma would not result in increased magnesium (Choice F) and does not generally affect magnesium concentrations.

Educational Objective: MEN IIA and IIB involve pheochromocytoma and medullary thyroid carcinoma. Medullary thyroid carcinoma arises from parafollicular C cells and produces calcitonin.

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37. A 27-year-old man with ulcerative colitis is admitted to the hospital because of a 5-day history of increasingly severe bloody diarrhea and abdominal cramps, fatigue, and generalized weakness. He receives infliximab infusions every 2 weeks. His only other medication is a daily multivitamin. His temperature is 37.2°C (99°F), pulse is 100/min, and blood pressure is 100/70 mm Hg. Examination shows a soft abdomen; there is moderate tenderness to deep palpation of the left lower quadrant. Laboratory studies show a hematocrit of 36% and leukocyte count of 4000/mm^3. Colonoscopy shows diffusely erythematous mucosa and superficial ulcers extending contiguously from the rectum to the proximal descending colon. Biopsies of the colonic mucosa show intracellular inclusion bodies. Which of the following is the most appropriate next step in management?

A) Administration of adalimumab
B) Administration of ganciclovir
C) Administration of hydrocortisone
D) Administration of metronidazole
E) Transfusion of 2 units of packed red blood cells

Correct Answer: B.

Cytomegalovirus (CMV), also known as human herpesvirus 5 (HHV-5), is an opportunistic pathogen that commonly causes disease in immunocompromised patients in the setting of severe ulcerative colitis, solid-organ or allogeneic bone marrow transplantation, or HIV/AIDS. It can be transmitted through multiple modes, including sexual contact, urine, respiratory droplets, and to a fetus via the placenta. Disease manifestations include colitis, retinitis, esophagitis, encephalitis, and pneumonia. The classic histologic findings of CMV infection are mononuclear cell infiltrates with infected cells showing prominent intracellular inclusion bodies. Treatment for all human herpesvirus infections involves drugs that inhibit viral DNA polymerase, classically by using guanosine analogs such as acyclovir, valacyclovir, and famciclovir. Prior to exerting their antiviral effects, most guanosine analogs must be phosphorylated by the viral enzyme thymidine kinase. CMV does not have the necessary thymidine kinase needed for phosphorylation of most common guanosine analogs; however, it does have the necessary phosphorylating enzyme to activate ganciclovir. Administration of ganciclovir is the most appropriate next step in management for this patient with CMV colitis.

Incorrect Answers: A, C, D, and E.

Administration of adalimumab (Choice A) [illegible]

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E) Transfusion of 2 units of packed red blood cells

Correct Answer: B.

Cytomegalovirus (CMV), also known as human herpesvirus 5 (HHV-5), is an opportunistic pathogen that commonly causes disease in immunocompromised patients in the setting of severe ulcerative colitis, solid-organ or allogeneic bone marrow transplantation, or HIV/AIDS. It can be transmitted through multiple modes, including sexual contact, urine, respiratory droplets, and to a fetus via the placenta. Disease manifestations include colitis, retinitis, esophagitis, encephalitis, and pneumonia. The classic histologic findings of CMV infection are mononuclear cell infiltrates with infected cells showing prominent intracellular inclusion bodies. Treatment for all human herpesvirus infections involves drugs that inhibit viral DNA polymerase, classically by using guanosine analogs such as acyclovir, valacyclovir, and famciclovir. Prior to exerting their antiviral effects, most guanosine analogs must be phosphorylated by the viral enzyme thymidine kinase. CMV does not have the necessary thymidine kinase needed for phosphorylation of most common guanosine analogs; however, it does have the necessary phosphorylating enzyme to activate ganciclovir. Administration of ganciclovir is the most appropriate next step in management for this patient with CMV colitis.

Incorrect Answers: A, C, D, and E.

Administration of adalimumab (Choice A) or another tumor necrosis factor inhibitor is contraindicated at this time in the setting of active infection with CMV colitis. Tumor necrosis factor inhibitors have a role in inducing remission in moderate to severe symptomatic ulcerative colitis. Administration of hydrocortisone (Choice C) can also be used in acute symptomatic flares but would not be appropriate in the setting of CMV colitis.

Administration of metronidazole (Choice D) is commonly used in empiric antibiotic regimens for intra-abdominal and gastrointestinal infections because of excellent coverage of enteric anaerobic bacteria; however, the presence of intracellular inclusion bodies on biopsy and a normal leukocyte count are more suggestive of CMV colitis than bacterial infection.

Transfusion of 2 units of packed red blood cells (Choice E) is not indicated for this patient with a hematocrit of 36% and no evidence of rapid exsanguination with hemodynamic instability. The transfusion threshold for anemia is a hematocrit concentration of 21%, though packed red blood cells may be transfused above that value in the setting of profuse, ongoing, active gastrointestinal hemorrhage.

Educational Objective: Cytomegalovirus is an opportunistic pathogen that commonly causes disease in immunocompromised patients in the setting of severe ulcerative colitis, solid-organ or allogeneic bone marrow transplantation, or HIV/AIDS. Intracellular inclusion bodies are classically observed on histologic examination.

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38. A 54-year-old woman with hypertension is admitted to the hospital because of a 1-week history of nausea, vomiting, and diarrhea. She says she has been vomiting four to five times daily and has not been able to keep any food or liquids down. She has had up to 10 nonbloody loose stools daily. She reports no fever or chills. She says she previously had been well, but she noticed that her blood pressure had been higher than usual during the past 2 weeks, and she was planning to see her primary care physician. She is a pediatric nurse and had been caring for several patients with unspecified viral gastroenteritis 1 week before she became ill. She has hyperlipidemia. Medications are hydrochlorothiazide and atorvastatin. The patient is 168 cm (5 ft 6 in) tall and weighs 73 kg (162 lb); BMI is 26 kg/m^2. Temperature is 37.3°C (99.2°F), pulse is 110/min, and blood pressure is 126/68 mm Hg. Abdominal examination discloses mild, diffuse tenderness to palpation without rebound or guarding. Results of complete blood count and urinalysis are within the reference ranges. Results of serum chemistry profile and urine electrolyte concentrations are shown:

Serum		Urine	
Urea nitrogen	22 mg/dL	Na^+	<10 mmol/L
Creatinine	1.0 mg/dL	K^+	30 mmol/L
Na^+	136 mEq/L	Cl^-	12 mmol/L
K^+	3.1 mEq/L		
Cl^-	95 mEq/L		
HCO_3^-	34 mEq/L		

Arterial blood gas analysis on room air:

Po_2	98 mm Hg
Pco_2	49 mm Hg
pH	7.51

Which of the following is the most likely cause of this patient's laboratory results?

A) Addison disease
B) Adrenal adenoma
C) Diarrhea

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Arterial blood gas analysis on room air:

Po_2	98 mm Hg
Pco_2	49 mm Hg
pH	7.51

Which of the following is the most likely cause of this patient's laboratory results?

A) Addison disease
B) Adrenal adenoma
C) Diarrhea
D) Diuretic use
E) Vomiting

Correct Answer: E.

This patient presents with symptoms of viral gastroenteritis, including nausea, vomiting, diarrhea, and abdominal discomfort. The loss of gastrointestinal contents can lead to a variety of acid-base disorders, depending on whether vomiting or diarrhea are predominant. This patient's electrolyte findings are consistent with metabolic alkalosis, characterized by increased serum pH and bicarbonate concentration, as well as mildly decreased serum concentrations of potassium and chloride, along with low urine sodium and chloride concentrations. Metabolic alkalosis is a common result of excessive vomiting because of the direct loss of protons and chloride in gastric secretions. In contrast, diarrhea results in the excessive loss of bicarbonate ions and most commonly results in hyperchloremic metabolic acidosis. Fluid and electrolyte repletion are the cornerstone of treatment, in addition to treating the underlying cause.

Incorrect Answers: A, B, C, and D.

Addison disease (Choice A) is characterized by hypoaldosteronism and resultant hyponatremia and metabolic acidosis as a result of impairment of renal tubular sodium proton exchange.

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D) Diuretic use

E) Vomiting

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Addison disease (Choice A) is characterized by hypoaldosteronism and resultant hyponatremia and metabolic acidosis as a result of impairment of renal tubular sodium proton exchange.

Adrenal adenoma (Choice B) may lead to hyperaldosteronism, or Conn syndrome. Conn syndrome presents with electrolyte disturbances including hypernatremic, hypertensive, metabolic alkalosis with hypokalemia caused by the loss of potassium and protons in urine, and an increased urine chloride concentration, typically greater than 40 mEq/L.

Diarrhea (Choice C) may produce a variety of electrolyte disturbances, but it most commonly causes hyperchloremic metabolic acidosis as a result of loss of bicarbonate in stool. This patient's serum pH and bicarbonate concentration are more suggestive of metabolic alkalosis.

Diuretic use (Choice D), especially thiazides and loop diuretics, may lead to metabolic alkalosis secondary to intravascular volume contraction. This patient's history of vomiting and diarrhea are more suggestive of gastrointestinal electrolyte loss.

Educational Objective: Metabolic alkalosis is a common result of excessive vomiting because of the direct loss of protons in gastric secretions. In contrast, diarrhea results in the excessive loss of bicarbonate ions and most commonly results in hyperchloremic, non-anion-gap metabolic acidosis.

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39. A case-control study is conducted to assess the relationship between childhood infection with varicella zoster virus and lymphoma. It is most appropriate to use which of the following methods to minimize recall bias in this study?

A) Choose cases and controls from the same population
B) Ensure that the investigators gathering exposure information are unaware of participant outcome status
C) Form a panel of blinded investigators to assign case and control definitions
D) Randomly select the controls from the population
E) Validate the exposure information with blood tests

Correct Answer: E.

When conducting an investigation, there are many potential biases that can cause a difference in outcome that is incorrectly attributed to the study exposure, leading the investigators to erroneously reject the null hypothesis. One such bias is recall bias, in which the awareness of a disorder impacts a subject's recall of past events. Recall bias commonly confounds retrospective studies such as this case-control study because participants may not accurately represent or recall prior exposures. In this case, patients with current diagnoses of lymphoma are being asked to recall if they were infected with varicella zoster virus as children. By validating the subject-reported exposure information with blood tests, data can be obtained that is independent of a subject's recollection of a past event. Another method to decrease recall bias is to shorten the length of time between exposure and follow-up so that subjects are more accurate in their recollections, though this may not always be possible based on the study design, especially in diseases with long latency periods such as malignancy.

Incorrect Answers: A, B, C, and D.

Choosing cases and controls from the same population (Choice A) minimizes confounding bias, not recall bias. Confounding bias occurs when an unmeasured characteristic differs between two groups of subjects and causes a difference in outcome that is incorrectly attributed to the study intervention. When cases and controls are from the same population and matched for demographic characteristics, the likelihood of a confounding variable being present is decreased.

Ensuring that the investigators gathering exposure information are unaware of participant outcome status (Choice B) will decrease the risk for observer-expectancy bias,

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Incorrect Answers: A, B, C, and D.

Choosing cases and controls from the same population (Choice A) minimizes confounding bias, not recall bias. Confounding bias occurs when an unmeasured characteristic differs between two groups of subjects and causes a difference in outcome that is incorrectly attributed to the study intervention. When cases and controls are from the same population and matched for demographic characteristics, the likelihood of a confounding variable being present is decreased.

Ensuring that the investigators gathering exposure information are unaware of participant outcome status (Choice B) will decrease the risk for observer-expectancy bias, when observers preferentially document results that support their hypothesis. This intervention will not impact recall bias.

Forming a panel of blinded investigators to assign case and control definitions (Choice C) will protect the study from measurement bias. Measurement, or detection, bias occurs when a systematic error occurs in the collection of data. By establishing clear definitions of cases and controls prior to initiating the study, measurement bias can be avoided.

Randomly selecting the controls from the population (Choice D) will assist in decreasing selection bias. Selection bias is a form of sampling bias in which the participants in the study systematically differ from the target population. By selecting controls randomly from the population, the investigators will increase the likelihood that study participants match the study's target population.

Educational Objective: Recall bias occurs when the awareness of a disorder impacts a subject's recall of past events. Recall bias commonly confounds retrospective studies because subjects may be more inclined to remember an event if they feel it negatively impacted their health. Validating subjects' self-reported data with an objective test is one way to decrease recall bias.

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40. A cohort study is conducted to evaluate the impact of fish consumption on the risk for developing cardiovascular disease. Participants complete a questionnaire about dietary habits, including fish consumption; responses are obtained from 2000 participants (80% response rate). The study participants are observed for 20 years, and cases of cardiovascular disease are identified through a data registry. Study results show:

Eating Fish (Frequency)	Cases with Cardiovascular Disease	Cases without Cardiovascular Disease	Total
Never	160	1440	1600
Almost Daily	20	380	400
Total	180	1820	2000

Based on these data, which of the following best represents the attributable risk for development of cardiovascular disease caused by lack of fish consumption in this population?

A) 0.01
B) 0.04
C) 0.05
D) 0.07
E) 0.09

Correct Answer: C.

The attributable risk for the development of cardiovascular disease caused by a lack of fish consumption in this population is 0.05. Attributable risk (AR) describes the risk for developing disease that can be attributed to the exposure as compared with the risk that exists without exposure. AR is calculated as the difference between disease incidence among those with the exposure and those without the exposure, or AR = (a / (a + b)) - (c / (c + d)). In this case, the exposure or risk is the lack of fish consumption. The risk for development of cardiovascular disease in patients who lacked fish consumption is calculated as (160) / (160 + 1440). The risk for development of cardiovascular disease in patients who ate fish almost daily is calculated as (20) / (20 + 380). In this scenario, AR = (160 / (160 + 1440)) – (20 / (20 + 380)) = 0.05.

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A) 0.01
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E) 0.09

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

0.01 (Choice A), 0.04 (Choice B), 0.07 (Choice D), and 0.09 (Choice E) all reflect mathematical errors or the use of an incorrect equation. AR is calculated as the difference in the incidence of cardiovascular disease in patients who lacked fish consumption and the incidence of cardiovascular disease in patients who ate fish almost daily. The mathematical calculation is performed as follows: AR = (160 / (160 + 1440)) - (20 / (20 + 380)) = (160 / 1600) - (20 / 400) = (160 / 1600) - (80 / 1600) = 80 / 1600 = 0.05.

Educational Objective: Attributable risk (AR) describes the risk for developing disease that can be attributed to the exposure as compared with the risk that exists without exposure. AR is calculated as the difference between disease incidence among those with the exposure and those without the exposure.

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41. A study is conducted to determine if there is an association between tampon use and toxic shock syndrome (TSS). A total of 50 patients with TSS and 450 patients without TSS are enrolled in the study. The patients are matched for age and race. All patients are interviewed to determine if they use tampons. When analyzing the data, which of the following is the most appropriate statistical method to use for this study?

A) Analysis of variance
B) Chi-square test
C) Correlation coefficient
D) Mann-Whitney test
E) Regression analysis
F) Unpaired *t*-test

Correct Answer: B.

The most appropriate statistical method to use for this study is the chi-square test. Statistical tests can be employed to assess whether a difference in values exists. Often, these values are means, though they need not be. Many tests have been derived to assess differences in numerical, quantitative, categorical, and qualitative datasets. Choosing the appropriate test is important in order to appropriately draw conclusions from data. In this case, comparing tampon use across two groups is a comparison of categorical values (the presence or absence of tampon use), which is best assessed by a chi-square test. Chi-square tests assess for statistically significant differences between two or more categorical values (eg, proportions, percentages). They are commonly used for larger samples and is also able to compare multiple values (eg, three different experimental groups). In this study, assessing the use of tampons in two groups, one with TSS and one of controls, is a categorical comparison.

Incorrect Answers: A, C, D, E, and F.

Analysis of variance (Choice A) is a statistical test that compares means between three or more groups. In this case, the comparison is of the percentage of patients in each group using tampons, and only two groups are analyzed.

Correlation coefficient (Choice C) is used to determine the degree of correlation between two variables. It is expressed as *r* and may range from -1 to 1. The stronger the

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Correct Answer: B.

The most appropriate statistical method to use for this study is the chi-square test. Statistical tests can be employed to assess whether a difference in values exists. Often, these values are means, though they need not be. Many tests have been derived to assess differences in numerical, quantitative, categorical, and qualitative datasets. Choosing the appropriate test is important in order to appropriately draw conclusions from data. In this case, comparing tampon use across two groups is a comparison of categorical values (the presence or absence of tampon use), which is best assessed by a chi-square test. Chi-square tests assess for statistically significant differences between two or more categorical values (eg, proportions, percentages). They are commonly used for larger samples and is also able to compare multiple values (eg, three different experimental groups). In this study, assessing the use of tampons in two groups, one with TSS and one of controls, is a categorical comparison.

Incorrect Answers: A, C, D, E, and F.

Analysis of variance (Choice A) is a statistical test that compares means between three or more groups. In this case, the comparison is of the percentage of patients in each group using tampons, and only two groups are analyzed.

Correlation coefficient (Choice C) is used to determine the degree of correlation between two variables. It is expressed as *r* and may range from -1 to 1. The stronger the positive correlation, the closer *r* will approach 1. The stronger the negative correlation, the closer *r* will approach -1. Because this study is not investigating the correlation between two variables, a correlation coefficient will not be useful.

Mann-Whitney test (Choice D) is a statistical test used to compare the difference between two groups when data collected are ranked values. In this case, a chi-square test is more appropriate.

Regression analysis (Choice E) models the relationship between dependent and independent variables in a linear fashion or without beginning with a predetermined form but instead deriving the trend from the data. It is not used to compare means or percentages.

Unpaired *t*-test (Choice E) is a form of *t*-test and calculates the difference between the means of two unrelated groups. For example, an unpaired *t*-test would be used to compare the resting heart rates between athletes and non-athletes to assess for statistically significant differences.

Educational Objective: Chi-square tests assess for statistically significant differences between two or more categorical values (eg, proportions, percentages).

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42. A 22-year-old man is admitted to the intensive care unit after he sustained a severe head injury in a motorcycle collision. Three days later, he remains intubated and has had no spontaneous respirations. His temperature is 37°C (98.6°F). His pupils are fixed and dilated, and he is unresponsive to all physical and verbal stimuli. He has no cranial nerve reflexes, and repeated EEG shows no electrical activity. He is receiving no medications. Toxicology screening is negative. Which of the following is the most accurate statement regarding continuation of mechanical ventilation for this patient?

A) Mechanical ventilation may be withdrawn only if a do-not-resuscitate order has been signed by the next of kin
B) Mechanical ventilation may be withdrawn only if the patient has a living will
C) Mechanical ventilation may be withdrawn only with court approval
D) Mechanical ventilation may be withdrawn without the family's permission

Correct Answer: D.

According to the American Academy of Neurology, brain death is defined as the permanent loss of all brainstem functions. Brain death commonly occurs after an acute catastrophic brain injury secondary to intracranial trauma, intracranial hemorrhage, or cardiovascular collapse. Brain death can be diagnosed by a neurologic examination (demonstrating absent cranial nerve reflexes and a lack of response to central pain) and an apnea test (showing an absence of respiratory drive). Ancillary tests such as EEG and angiography can be used when the diagnosis is uncertain. A patient with brain death is clinically and legally dead. As such, mechanical ventilation may be withdrawn without family permission. Hospital policies may vary to some extent on the exact timing of a brain death examination, and physicians should be familiar with the standard of care in their individual settings.

Incorrect Answers: A, B, and C.

Physicians do not require a do-not-resuscitate (DNR) order, living will, or court approval (Choices A, B, and C) to discontinue mechanical ventilation for patients who are dead by legal and clinical definition. DNR orders, living wills, and court approval apply to patients in persistent vegetative states or coma rather than patients who are dead.

Educational Objective: Brain death, or the permanent loss of all brainstem functions, is diagnosed by neurologic examination and apnea test. Brain death constitutes legal and clinical death, and mechanical ventilation may be withdrawn without the family's permission.

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Incorrect Answers: A, B, and C.

Physicians do not require a do-not-resuscitate (DNR) order, living will, or court approval (Choices A, B, and C) to discontinue mechanical ventilation for patients who are dead by legal and clinical definition. DNR orders, living wills, and court approval apply to patients in persistent vegetative states or coma rather than patients who are dead.

Educational Objective: Brain death, or the permanent loss of all brainstem functions, is diagnosed by neurologic examination and apnea test. Brain death constitutes legal and clinical death, and mechanical ventilation may be withdrawn without the family's permission.

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43. A 77-year-old woman is brought to the physician by her son because of palpitations for the past month. She had a cerebral infarction 5 years ago and has residual partial paralysis of her right leg. She uses an orthotic brace on her right ankle and a walker. She has fallen three times during the past year but has not sustained any injuries. She has a 5-year history of type 2 diabetes mellitus treated with metformin. Her vision is 20/60 in her left eye, but she is able to read large print. Her pulse is 120/min and irregularly irregular, and blood pressure is 135/78 mm Hg. Crackles are heard at the lung bases. A grade 2/6 systolic murmur is heard best at the lower left sternal border. Abdominal examination shows no abnormalities. There is 2+ edema below the knees. Neurologic examination shows unchanged hemiparesis. Laboratory studies show:

Hematocrit	37%
Leukocyte count	4700/mm^3 with a normal differential
Serum	
Urea nitrogen	27 mg/dL
Creatinine	1.4 mg/dL

An ECG shows atrial fibrillation with a ventricular rate between 90/min and 140/min. Echocardiography shows an ejection fraction of 40%. Which of the following is the most appropriate next step in management?

A) Measurement of serum thyroid-stimulating hormone concentration
B) Tilt test
C) 24-Hour ambulatory ECG monitoring
D) Electrophysiologic studies
E) Placement of a cardiac pacemaker

Correct Answer: A.

Atrial fibrillation is a common cardiac dysrhythmia. While atrial fibrillation can be asymptomatic, symptoms with rapid ventricular response include palpitations, fatigue, shortness of breath, light-headedness, angina, and presyncope or syncope. Physical examination will demonstrate an irregularly irregular pulse and occasionally may show signs of heart failure or a heart murmur. An ECG with an irregular RR interval and absent P waves confirms the diagnosis. Risk factors for the development of atrial

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A) Measurement of serum thyroid-stimulating hormone concentration
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E) Placement of a cardiac pacemaker

Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Tilt test (Choice B) may be used in the evaluation of presyncope, syncope, and unexplained falls to identify a vasovagal or orthostatic cause. Patients typically report symptoms with changes in position. This patient's newly diagnosed atrial fibrillation provides a likely explanation for her recurrent falls.

24-Hour ambulatory ECG monitoring (Choice C) is not required with an established diagnosis of atrial fibrillation observed on ECG in the office. Ambulatory monitoring can be useful for evaluation of reported palpitations, presyncope, syncope, and unexplained falls in a patient with an unrevealing office examination.

Electrophysiologic studies (Choice D) may be considered later in the patient's management if her atrial fibrillation is refractory to medical management and/or catheter ablation is considered. It is more appropriate to evaluate for reversible causes of atrial fibrillation such as hyperthyroidism at this initial visit.

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Atrial fibrillation is a common cardiac dysrhythmia. While atrial fibrillation can be asymptomatic, symptoms with rapid ventricular response include palpitations, fatigue, shortness of breath, light-headedness, angina, and presyncope or syncope. Physical examination will demonstrate an irregularly irregular pulse and occasionally may show signs of heart failure or a heart murmur. An ECG with an irregular RR interval and absent P wave confirms the diagnosis. Risk factors for the development of atrial fibrillation include hypertension, coronary artery disease, structural heart or valvular disease, pulmonary embolism, lung disorders such as obstructive sleep apnea or chronic obstructive pulmonary disease, stimulant abuse, and hyperthyroidism. Complications of atrial fibrillation include tachycardia-induced heart failure, hemodynamic instability, and left atrial appendage thrombus formation with subsequent embolic strokes. Patients with a new diagnosis of atrial fibrillation should receive evaluation for potentially reversible causes with measurement of serum thyroid-stimulating hormone concentration and screening for high-risk amounts of alcohol intake. Treatment includes heart rate control with β-adrenergicblockers or nondihydropyridine calcium channel blockers, such as metoprolol or diltiazem, and anticoagulation for patients at an increased risk for stroke, which can be assessed by using a validated tool such as the CHA_2DS_2-VASc score.

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Electrophysiologic studies (Choice D) may be considered later in the patient's management if her atrial fibrillation is refractory to medical management and/or catheter ablation is considered. It is more appropriate to evaluate for reversible causes of atrial fibrillation such as hyperthyroidism at this initial visit.

Placement of a cardiac pacemaker (Choice E) is not indicated at this time. The most common indications for pacemaker placement are sinus node dysfunction, symptomatic bradycardia, and high-grade atrioventricular block.

Educational Objective: New-onset atrial fibrillation is a common diagnosis. Patients should initially be evaluated for hemodynamic stability and potential need for hospitalization, symptoms of heart failure, potential underlying causes (including structural heart disease, electrolyte disturbances, hyperthyroidism, and chronic alcohol or stimulant use), and need for anticoagulation to decrease stroke risk.

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44. A 37-year-old man comes to the physician 12 hours after the onset of vomiting and abdominal cramps and swelling. He has had constipation for the past 4 days. He was diagnosed with Crohn disease 7 years ago. His symptoms of diarrhea and right lower quadrant abdominal pain have been well controlled with mesalamine for the past 3 years. His temperature is 36°C (96.8°F), pulse is 98/min and regular, and blood pressure is 110/70 mm Hg. Examination shows a diffusely distended, tympanitic abdomen and visible peristalsis; high-pitched bowel sounds are heard. Rectal examination shows no stool in the rectal vault. An x-ray of the abdomen shows a small-bowel obstruction. Which of the following is the most likely cause of these findings?

A) Colon cancer
B) Ileocecal fistula
C) Small-bowel adhesions
D) Small-bowel fibrotic stricture
E) Small-bowel intussusception

Correct Answer: D.

Crohn disease is characterized by transmural inflammation of the gastrointestinal tract, most frequently involving the terminal ileum. It can arise anywhere in the gastrointestinal tract and is a subclass of inflammatory bowel disease. Most patients experience chronic abdominal cramping, bloody diarrhea, and weight loss. Physical examination often demonstrates generalized abdominal tenderness, sometimes worse in the right lower quadrant, and, depending on the severity and extent, may show complications such as enterocutaneous fistulas and extraintestinal manifestations such as uveitis. Severe Crohn disease can result in intestinal obstruction from stricture or inflammation, bowel perforation, intra-abdominal abscess, and the formation of intra-abdominal fistulas. Diagnosis occurs through imaging and biopsy. Laboratory analyses often show increased erythrocyte sedimentation rate and C-reactive protein. On fluoroscopic small bowel follow-through, narrowing of the intestinal lumen at the terminal ileum is commonly seen, along with other sites of strictures or fistulous formation. Treatment is with anti-inflammatory medications, immunomodulators, and glucocorticoids, while complicated, severe cases sometimes require surgery including small bowel resection or colectomy.

Incorrect Answers: A, B, C, and E.

Colon cancer (Choice A) can cause a large bowel obstruction but would be unlikely to cause a small bowel obstruction.

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D) Small-bowel fibrotic stricture

E) Small-bowel intussusception

Correct Answer: D.

Crohn disease is characterized by transmural inflammation of the gastrointestinal tract, most frequently involving the terminal ileum. It can arise anywhere in the gastrointestinal tract and is a subclass of inflammatory bowel disease. Most patients experience chronic abdominal cramping, bloody diarrhea, and weight loss. Physical examination often demonstrates generalized abdominal tenderness, sometimes worse in the right lower quadrant, and, depending on the severity and extent, may show complications such as enterocutaneous fistulas and extraintestinal manifestations such as uveitis. Severe Crohn disease can result in intestinal obstruction from stricture or inflammation, bowel perforation, intra-abdominal abscess, and the formation of intra-abdominal fistulas. Diagnosis occurs through imaging and biopsy. Laboratory analyses often show increased erythrocyte sedimentation rate and C-reactive protein. On fluoroscopic small bowel follow-through, narrowing of the intestinal lumen at the terminal ileum is commonly seen, along with other sites of strictures or fistulous formation. Treatment is with anti-inflammatory medications, immunomodulators, and glucocorticoids, while complicated, severe cases sometimes require surgery including small bowel resection or colectomy.

Incorrect Answers: A, B, C, and E.

Colon cancer (Choice A) can cause a large bowel obstruction but would be unlikely to cause a small bowel obstruction.

Ileocecal fistula (Choice B) can be asymptomatic or lead to abscess formation. Fistulas present with a variety of symptoms depending on their location. For example, enterovesical fistulas involving the bladder can lead to urinary tract infections and pneumaturia.

Small-bowel adhesions (Choice C) are the most common cause of small bowel obstructions in patients who have undergone prior abdominal surgery. This patient's obstruction is more likely secondary to complications of Crohn disease.

Small-bowel intussusception (Choice E) describes telescoping of one segment of bowel into another, which can cause intestinal ischemia and/or obstruction. It is typically caused by a pathological lead point (eg, malignancy, stricture, lymphadenopathy) and presents with colicky pain and bloating. It more commonly presents in children.

Educational Objective: Crohn disease can lead to complications such as a stricture, bowel perforation, intra-abdominal abscess, and the formation of fistulas. Strictures can cause intestinal obstructions such as small bowel obstructions.

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45. A 62-year-old man comes to the physician to discuss the results of an abdominal CT scan that was performed 4 days ago. He is undergoing evaluation for a 2-month history of increasing back pain and a 6.8-kg (15-lb) weight loss. An initial physical examination showed no abnormalities. The CT scan showed a 4-cm solid mass in the body of the pancreas, multiple defects in the liver consistent with metastases, and a 7-cm abdominal aortic aneurysm with involvement of the renal arteries and no evidence of leakage. A CT scan-guided biopsy of the mass is performed. Examination of the specimen shows a pancreatic adenocarcinoma. After listening to the physician's explanation of his prognosis, the patient says, "So you think I have a pancreatic cancer that is too advanced to remove. But what about the aneurysm? Should I have something done about that?" Which of the following is the most appropriate recommendation with respect to repair of this patient's aneurysm?

A) The aneurysm should be repaired because of its large size
B) The aneurysm should be repaired only if the procedure can be performed with minimally invasive endovascular techniques
C) The aneurysm should not be repaired because of the location of the pancreatic cancer
D) The aneurysm should not be repaired because of the patient's poor prognosis
E) The aneurysm should not be repaired because the operation would be likely to stimulate the growth of the pancreatic cancer

Correct Answer: D.

Pancreatic adenocarcinoma often presents with nonspecific symptoms such as chronic abdominal pain radiating to the back, loss of appetite, nausea, vomiting, fatigue, and weight loss. If the pancreatic adenocarcinoma is located in the pancreatic head/neck region, it can result in painless obstructive jaundice. Surgical resection can be curative, but pancreatic cancer often presents with symptoms late in its course (as in this case), and few patients have resectable disease at the time of diagnosis. The majority of patients have either locally advanced or metastatic disease not amenable to surgical resection. For these patients, systemic chemotherapy can improve survival, but the focus of management is primarily palliative symptom control. The mortality and poor prognosis of this patient's locally advanced and metastatic pancreatic cancer precludes him from repair of his abdominal aortic aneurysm, since he would be unlikely to benefit from this invasive procedure. The 5-year survival rate for advanced pancreatic cancer is generally less than 5%, with many patients succumbing to disease within the first 6 to 12 months following diagnosis.

Incorrect Answers: A, B, C, and E.

Because of the patient's poor prognosis, the aneurysm should not be repaired (Choices A and B) since it is an invasive procedure with chances for complications and

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B) The aneurysm should be repaired only if the procedure can be performed with minimally invasive endovascular techniques

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Incorrect Answers: A, B, C, and E.

Because of the patient's poor prognosis, the aneurysm should not be repaired (Choices A and B) since it is an invasive procedure with chances for complications and perioperative morbidity and mortality. With locally advanced and metastatic pancreatic cancer, median survival is less than 1 year. Thus, the mortality risk from pancreatic cancer is higher than the risk for aortic aneurysm rupture.

The location of the pancreatic cancer (Choice C) does not preclude repair of the aneurysm given the difference in location of the pancreatic cancer and the aortic aneurysm, which would still allow for surgical access to the aorta. Rather, the patient would not benefit from aneurysm repair given his poor prognosis.

The operation has not been shown to stimulate the growth of pancreatic cancer (Choice E).

Educational Objective: Pancreatic cancer often presents late in its course with locally advanced disease and/or metastatic disease with poor prognosis. Management in these cases is focused on palliative care.

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46. A 52-year-old man comes to the emergency department 3 days after he sustained an injury to his left foot while walking barefoot on the beach. He says he initially thought he only had a minor cut, but he now has severe pain that radiates from his left foot to his groin. Ten years ago, he underwent cadaveric liver transplantation for hepatitis C. Current medications include mycophenolate and prednisone. On arrival, he appears diaphoretic and ill. His temperature is 39.2°C (102.6°F), pulse is 120/min, respirations are 24/min, and blood pressure is 110/60 mm Hg. Examination shows erythema and hemorrhagic bullae over the left calf and foot. The skin is warm and tender to touch from over the left mid calf to the foot. Pulses in the distal lower extremities are equal bilaterally. His leukocyte count is 16,000/mm^3 with 82% segmented neutrophils, 15% bands, and 3% eosinophils. Results of blood cultures are pending. In addition to intravenous administration of antibiotics, which of the following is the most appropriate next step in management?

A) Discontinue prednisone
B) Hyperbaric oxygen therapy
C) Intravenous immune globulin therapy
D) Surgical debridement
E) Amputation
F) No additional management is indicated

Correct Answer: D.

Vibrio vulnificus is a gram-negative bacterium associated with shellfish, particularly oysters, and saltwater, which more commonly infects patients with underlying liver disease, such as alcoholic cirrhosis, hereditary hemochromatosis, or liver transplant, as in this patient. It is also more common in patients with chronic medical conditions, such as diabetes mellitus and chronic kidney disease. Inoculation can occur through ingestion of raw oysters or through exposure of a wound to the bacteria, and it can cause watery diarrhea, wound infection, and/or septicemia. Wound infections can present as mild cellulitis or can progress to necrotizing fasciitis with fever, pain out of proportion to examination, crepitus, and hemorrhagic bullae in at-risk individuals. Septicemia can also occur, and it presents with hypotension, leukocytosis, fever, and, in severe cases, disseminated intravascular coagulation. Diagnosis is confirmed with wound or blood cultures, but there should be a high index of suspicion for the infection given the high case-fatality rate. Intravenous antibiotic therapy with minocycline or doxycycline plus cefotaxime or ceftriaxone should be started immediately, and patients with evidence of necrotizing soft tissue infection, as in this patient, should undergo emergent surgical debridement.

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F) No additional management is indicated

Correct Answer: D.

Vibrio vulnificus is a gram-negative bacterium associated with shellfish, particularly oysters, and saltwater, which more commonly infects patients with underlying liver disease, such as alcoholic cirrhosis, hereditary hemochromatosis, or liver transplant, as in this patient. It is also more common in patients with chronic medical conditions, such as diabetes mellitus and chronic kidney disease. Inoculation can occur through ingestion of raw oysters or through exposure of a wound to the bacteria, and it can cause watery diarrhea, wound infection, and/or septicemia. Wound infections can present as mild cellulitis or can progress to necrotizing fasciitis with fever, pain out of proportion to examination, crepitus, and hemorrhagic bullae in at-risk individuals. Septicemia can also occur, and it presents with hypotension, leukocytosis, fever, and, in severe cases, disseminated intravascular coagulation. Diagnosis is confirmed with wound or blood cultures, but there should be a high index of suspicion for the infection given the high case-fatality rate. Intravenous antibiotic therapy with minocycline or doxycycline plus cefotaxime or ceftriaxone should be started immediately, and patients with evidence of necrotizing soft tissue infection, as in this patient, should undergo emergent surgical debridement.

Incorrect Answers: A, B, C, E, and F.

Discontinuing prednisone (Choice A) may be necessary in this patient in the setting of acute infection. However, this decision should be made in careful consultation with the transplant team. Additionally, while discontinuing prednisone may be beneficial in preventing worsening infection, it does not provide definitive therapy for the patient's ongoing necrotizing fasciitis, risks transplant rejection, and risks an addisonian crisis with refractory endocrine shock.

Hyperbaric oxygen therapy (Choice B) is used in the treatment of necrotizing soft tissue infections, such as clostridial myonecrosis, and to enhance healing of complicated wounds. While it may be used in the treatment of this patient's necrotizing soft tissue infection, removal of the infected soft tissue is the more pertinent next step.

Intravenous immune globulin therapy (Choice C) can be used to treat autoimmune conditions (eg, immune thrombocytopenia), neuroimmunologic disorders (eg, Guillain-Barré syndrome), and immunodeficiencies, among other pathologies. It plays no role in the treatment of *Vibrio vulnificus* infections.

Amputation (Choice E) may be necessary in this patient, depending on the extent of his infection. Often, patients with necrotizing soft tissue infections will require repeated irrigation and debridement to control infection, which at times necessitates amputation. However, proceeding with amputation rather than initial attempts at limb-sparing soft tissue debridement would be inappropriate.

No additional management indicated (Choice F) is incorrect, since this patient has a severe infection that is associated with significant morbidity and mortality. He should

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severe cases, disseminated intravascular coagulation. Diagnosis is confirmed with wound or blood cultures, but there should be a high index of suspicion for the infection given the high case-fatality rate. Intravenous antibiotic therapy with minocycline or doxycycline plus cefotaxime or ceftriaxone should be started immediately, and patients with evidence of necrotizing soft tissue infection, as in this patient, should undergo emergent surgical debridement.

Incorrect Answers: A, B, C, E, and F.

Discontinuing prednisone (Choice A) may be necessary in this patient in the setting of acute infection. However, this decision should be made in careful consultation with the transplant team. Additionally, while discontinuing prednisone may be beneficial in preventing worsening infection, it does not provide definitive therapy for the patient's ongoing necrotizing fasciitis, risks transplant rejection, and risks an addisonian crisis with refractory endocrine shock.

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No additional management indicated (Choice F) is incorrect, since this patient has a severe infection that is associated with significant morbidity and mortality. He should be treated immediately with intravenous antibiotics and undergo source control with operative surgical debridement.

Educational Objective: *Vibrio vulnificus* is a bacterium present in shellfish and saltwater that causes watery diarrhea, wound infections, and septicemia in at-risk individuals. It more commonly causes infections in patients with underlying liver disease, such as hemochromatosis or cirrhosis, and chronic medical conditions, such as diabetes mellitus. Wound infections can progress to necrotizing fasciitis with fever, severe pain, erythema, crepitus, and bullous lesions, whereas septicemia can cause hypotension, leukocytosis, and disseminated intravascular coagulation. Management includes intravenous antibiotic therapy and operative surgical debridement of the infected wound.

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47. A 72-year-old man has decreased urine output 2 days after admission to the hospital for treatment of cholecystitis. His urine output has been 15 mL/h over the past 3 hours. On admission, results of laboratory studies were consistent with gram-negative bacteremia and disseminated intravascular coagulation. He is currently receiving intravenous fluids, cefoxitin, and gentamicin. His temperature is 38.5°C (101.3°F), pulse is 110/min, respirations are 24/min, and blood pressure is 90/64 mm Hg. Abdominal examination shows mild right upper quadrant tenderness. His serum creatinine concentration has increased from 1.5 mg/dL 2 days ago to 3 mg/dL. This patient is most likely to have which of the following sets of urinalysis findings?

	Blood	Protein	RBC (/hpf)	WBC (/hpf)	Casts	Other Microscopic Findings
A)	None	none	none	none	hyaline	none
B)	None	4+	none	none	none	oval fat bodies
C)	Trace	1+	0–5	>50	none	WBC clumps
D)	1+	1+	0–5	0–5	pigmented granular	renal tubular epithelial cells
E)	1+	1+	5–10	10–20	none	eosinophils
F)	3+	1+	>50	none	RBC	none
G)	4+	1+	none	none	pigmented granular	squamous epithelial cells
H)	4+	1+	10–20 dysmorphic	none	none	none

Correct Answer: D.

The underlying cause of the patient's acute kidney injury is most likely acute tubular necrosis (ATN) secondary to decreased perfusion in the setting of bacteremia, sepsis, and hypotension. The most common cause of ATN is ischemic injury as a result of inadequate perfusion, and it often occurs because of sepsis, hypovolemia, medication or substance-induced hypotension, and cardiogenic shock. ATN can also be caused by direct cytotoxic injury from nephrotoxins such as myoglobin, hemoglobin, and ethylene glycol. The diagnosis can be made clinically and with laboratory evaluation including urinalysis, which will show pigmented granular (also called muddy brown) casts, which are composed of renal tubular epithelial cells bound in a Tamm-Horsfall (uromodulin) mucoprotein matrix. It is not uncommon for small amounts of blood, protein, RBCs, and WBCs to be present as well. Urine electrolyte studies may demonstrate an increased fractional excretion of sodium as a result of the inability of the

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F)	3+	1+	>50	none	RBC	none
G)	4+	1+	none	none	pigmented granular	squamous epithelial cells
H)	4+	1+	10–20 dysmorphic	none	none	none

Correct Answer: D.

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Incorrect Answers: A, B, C, E, F, G, and H.

Choice A describes a normal urinalysis. A patient with acute kidney injury as marked by a rapid increase in creatinine (most guidelines use an acute increase in creatinine by greater than or equal to 0.3 mg/dL or an increase greater than or equal to 1.5 times the baseline creatinine) in the setting of severe sepsis would be expected to have an abnormal urinalysis.

Choice B suggests nephrotic-range proteinuria (a quantitative measure of urine protein concentration is needed to confirm the diagnosis) with 4+ proteinuria and oval fat bodies on urine microscopy. Membranous nephropathy is the most common cause of nephrotic syndrome in white adults and may be primary (idiopathic) or secondary to conditions such as systemic lupus erythematosus, autoimmune disease against phospholipase A_2-receptors, chronic hepatitis infection (especially hepatitis B or C virus), or medications.

Choice C is consistent with inflammation of a section of the genitourinary tract with a large density of WBCs and WBC clumps on urine microscopy. This may be seen with urinary tract infections or pyelonephritis.

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Incorrect Answers: A, B, C, E, F, G, and H.

Choice A describes a normal urinalysis. A patient with acute kidney injury as marked by a rapid increase in creatinine (most guidelines use an acute increase in creatinine by greater than or equal to 0.3 mg/dL or an increase greater than or equal to 1.5 times the baseline creatinine) in the setting of severe sepsis would be expected to have an abnormal urinalysis.

Choice B suggests nephrotic-range proteinuria (a quantitative measure of urine protein concentration is needed to confirm the diagnosis) with 4+ proteinuria and oval fat bodies on urine microscopy. Membranous nephropathy is the most common cause of nephrotic syndrome in white adults and may be primary (idiopathic) or secondary to conditions such as systemic lupus erythematosus, autoimmune disease against phospholipase A_2-receptors, chronic hepatitis infection (especially hepatitis B or C virus), or medications.

Choice C is consistent with inflammation of a section of the genitourinary tract with a large density of WBCs and WBC clumps on urine microscopy. This may be seen with urinary tract infections or pyelonephritis.

Choice E suggests a diagnosis of acute interstitial nephritis (AIN) because of the presence of eosinophils. AIN may be caused by medications (especially antibiotics, nonsteroidal anti-inflammatory drugs, proton pump inhibitors), infections, or autoimmune disorders such as sarcoidosis and systemic lupus erythematosus.

Choice F is most suggestive of glomerulonephritis, in which RBC casts form as a result of abnormal passage of RBCs through damaged glomeruli. Dysmorphic RBCs are similarly noted in Choice H.

Choice G likely represents a sample that was contaminated, since squamous epithelial cells in the urine would come from the urethra, the vaginal opening, or the periurethral skin. This urinalysis is inadequate for interpretation, and a new sample should be collected.

Educational Objective: Acute tubular necrosis occurs following an ischemic or nephrotoxic insult to the kidneys, which results in necrosis of the tubular epithelium. Granular, muddy brown casts are typical on urinalysis.

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48. A 17-year-old patient, gravida 1, para 0, aborta 1, comes to the physician for a follow-up examination. Four weeks ago, she underwent dilatation and curettage (D&C) following a spontaneous abortion at 13 weeks' gestation. She has had no vaginal bleeding or pelvic pain. The patient has no history of serious illness. Her only current medication is an oral contraceptive; she adheres to her medication regimen. Today, pelvic examination shows no abnormalities. Prior to the D&C, her serum β-hCG concentration was 50,326 mIU/mL. Since the D&C, serial measurements of serum β-hCG concentrations have shown:

Week	β-hCG (mIU/mL)
1	18,275
2	8157
3	8356
4	14,589

Which of the following is the most likely diagnosis?

A) Endometritis
B) Gestational trophoblastic neoplasia
C) Hydatidiform mole
D) Retained products of conception
E) Septic abortion

Correct Answer: B.

Gestational trophoblastic neoplasia is a term used to describe a trophoblast-derived tumor, which includes invasive moles and choriocarcinoma. It can develop after a normal pregnancy, molar pregnancy, or miscarriage. Invasive moles and choriocarcinoma are often associated with increased concentrations of serum β-hCG following a pregnancy. Invasive moles develop after molar pregnancies and invade into the myometrium; however, distant metastasis is rare. Choriocarcinoma is the most common gestational trophoblastic neoplasia following a normal pregnancy and is highly invasive, often presenting with distant metastases. The most frequent sites of metastasis are the lungs, vagina, brain, and liver. Patients often present with vaginal bleeding and abdominopelvic pain with an inappropriately increased serum β-hCG concentration

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4	14,589

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Incorrect Answers: A, C, D, and E.

Endometritis (Choice A) is caused by an acute bacterial infection of the endometrium, most commonly in a postpartum patient. Symptoms include foul-smelling discharge, pelvic pain, fever, chills, and nausea. However, endometritis will not cause an increase in serum β-hCG concentrations.

Hydatidiform mole (Choice C) presents with nausea, vomiting, vaginal bleeding, preeclampsia, and a uterine size greater than expected dates as a result of either fertilization of an empty ovum (complete mole, no fetal parts) or dual fertilization of a normal ovum (partial mole, fetal parts present). It is a nonviable pregnancy. While it

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Hydatidiform mole (Choice C) presents with nausea, vomiting, vaginal bleeding, preeclampsia, and a uterine size greater than expected dates as a result of either fertilization of an empty ovum (complete mole, no fetal parts) or dual fertilization of a normal ovum (partial mole, fetal parts present). It is a nonviable pregnancy. While it would increase serum β-hCG concentrations, it would be unlikely to occur so shortly after a previous pregnancy with adequate contraception use.

Retained products of conception (Choice D) often present with vaginal bleeding, abdominal pain, and fever. Retained products of conception are less likely following a dilation and curettage and would not explain the increase in this patient's β-hCG concentrations.

Septic abortions (Choice E) are severe infections of the placenta, uterus, or products of conception before or after an abortion. While it can be caused by an ascending infection, it can also be caused during the surgical removal of products of conception in the setting of contaminated instruments. It presents with fever, tachycardia, and leukocytosis, but can progress to cause septic shock and acute respiratory distress syndrome if not treated. It is less likely in this otherwise well-appearing patient.

Educational Objective: Gestational trophoblastic neoplasia can develop after a normal pregnancy, molar pregnancy, or miscarriage. It typically presents with abnormal vaginal bleeding, abdominopelvic pain, and an increased β-hCG concentration. Invasive moles are primarily contained within the uterus, whereas choriocarcinoma frequently presents with distant metastases, most commonly to the lungs, vagina, and central nervous system. Treatment includes surgical resection and chemotherapy.

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49. A previously healthy 23-year-old man comes to the physician because of a 5-day history of fever, malaise, and headache. He has not had nausea, vomiting, cough, sore throat, diarrhea, pain with urination, or penile discharge. Medications include pseudoephedrine and ibuprofen for sinus headaches. He has no known recent exposure to illness and has not traveled recently outside the USA. He has been sexually active with four female partners over the past year and uses condoms inconsistently. He drinks two six-packs of beer weekly. He lives near tick-infested woods but has not noted a tick bite. He is 183 cm (6 ft) tall and weighs 95 kg (210 lb); BMI is 29 kg/m^2. His temperature is 38.3°C (101°F), pulse is 72/min, respirations are 12/min, and blood pressure is 126/68 mm Hg. Examination shows a nonpruritic, painless, pigmented, maculopapular rash over the palms and soles. There is diffuse lymphadenopathy. Which of the following is most likely to have prevented this patient's symptoms?

A) Abstinence from alcohol
B) Avoidance of ibuprofen use
C) Avoidance of soaps containing perfume
D) Consistent use of condoms
E) Immediate removal of ticks

Correct Answer: D.

This patient's clinical findings of a diffuse maculopapular rash involving the palms and soles along with lymphadenopathy are consistent with a diagnosis of secondary syphilis. Syphilis is caused by an infection with the spirochete *Treponema pallidum*. It demonstrates multiple stages with varying symptoms, including primary with a painless chancre; secondary with fever, diffuse maculopapular rash that involves the palms and soles, and condylomata lata; and tertiary with tabes dorsalis, aortitis, and gummas. Condyloma lata are typically whitish-gray, flat-topped lesions, which differentiates them from the verrucous papules of condyloma acuminata. First-line treatment for syphilis is with penicillin. Sexual intercourse is the means by which *Treponema pallidum* is acquired. This patient's high-risk sexual activity with multiple partners and inconsistent barrier contraception use puts him at higher risk for acquiring syphilis. The consistent use of condoms would likely have prevented this patient's symptoms.

Incorrect Answers: A, B, C, and E.

Abstinence from alcohol (Choice A) would not have prevented this patient's symptoms. Alcohol, when used in toxic amounts, can present with slurred speech, ataxia,

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D) Consistent use of condoms

E) Immediate removal of ticks

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Abstinence from alcohol (Choice A) would not have prevented this patient's symptoms. Alcohol, when used in toxic amounts, can present with slurred speech, ataxia, emotional lability, and memory lapses.

Avoidance of ibuprofen use (Choice B) would not have prevented this patient's symptoms. Excessive use of ibuprofen and other nonsteroidal anti-inflammatory drugs can cause acute kidney injury, gastritis, and/or peptic ulcer disease.

Soaps containing perfume (Choice C) can elicit a hypersensitivity reaction or allergic reaction in patients with atopic disease. A maculopapular rash involving the palms and soles is more consistent with syphilis.

Immediate removal of ticks (Choice E) would be helpful in preventing Lyme disease caused by *Borrelia burgdorferi*. The early stages of Lyme disease present with erythema chronicum migrans, arthralgia, and flu-like symptoms. Erythema chronicum migrans is an expanding rash with a central ring-like clearing, while a maculopapular rash involving the palms and soles is more consistent with syphilis.

Educational Objective: Syphilis is caused by *Treponema pallidum*, a sexually transmitted infection that demonstrates multiple stages of illness. Secondary syphilis is characterized by fever, diffuse maculopapular rash that involves the palms and soles, and lymphadenopathy.

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50. A 30-year-old primigravid woman with systemic lupus erythematosus comes to the physician for a prenatal visit at 34 weeks' gestation. Examination shows that her disease is in remission. She is concerned about the possible effects of her disease on her fetus. The fetus is at greatest risk for which of the following?

A) Atrial septal defect
B) Complete atrioventricular block
C) Endocarditis
D) Supraventricular tachycardia
E) Ventricular septal defect

Correct Answer: B.

Congenital atrioventricular (AV) block is a rare complication that can affect children born to mothers with systemic lupus erythematosus (SLE) or Sjögren syndrome. The condition is associated with the presence of anti-Ro and anti-La antibodies during pregnancy which cross the placenta and interfere with normal formation of the fetal AV node and surrounding myocardium. Improper necrosis caused by binding of autoantibodies with cardiomyocytes results in replacement of normal myocardium with fibrous tissue. In addition to the presence of autoantibodies, congenital AV block can be caused by structural heart abnormalities from other types of congenital heart disease or may be idiopathic. Patients may develop first-, second-, or third-degree AV block, with a significant risk for mortality in infants with third-degree AV block. Clinical manifestations vary depending on the severity of block; most cases are diagnosed in the perinatal period or by early childhood. Congenital AV block caused by maternal autoantibodies most often results in third- degree, or complete, fetal AV block.

Incorrect Answers: A, C, D, and E.

Atrial septal defect (Choice A) is a common congenital heart defect that may occur in isolation or in combination with other congenital heart disease syndromes. It is associated with fetal alcohol syndrome, Down syndrome, and trisomy 13 syndrome.

Endocarditis (Choice C) is extremely rare in the fetal and neonatal periods. Patients with congenital heart disease may be at higher risk than the general population because of structural deformities of the valves.

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D) Supraventricular tachycardia

E) Ventricular septal defect

Correct Answer: B.

Congenital atrioventricular (AV) block is a rare complication that can affect children born to mothers with systemic lupus erythematosus (SLE) or Sjögren syndrome. The condition is associated with the presence of anti-Ro and anti-La antibodies during pregnancy which cross the placenta and interfere with normal formation of the fetal AV node and surrounding myocardium. Improper necrosis caused by binding of autoantibodies with cardiomyocytes results in replacement of normal myocardium with fibrous tissue. In addition to the presence of autoantibodies, congenital AV block can be caused by structural heart abnormalities from other types of congenital heart disease or may be idiopathic. Patients may develop first-, second-, or third-degree AV block, with a significant risk for mortality in infants with third-degree AV block. Clinical manifestations vary depending on the severity of block; most cases are diagnosed in the perinatal period or by early childhood. Congenital AV block caused by maternal autoantibodies most often results in third- degree, or complete, fetal AV block.

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Endocarditis (Choice C) is extremely rare in the fetal and neonatal periods. Patients with congenital heart disease may be at higher risk than the general population because of structural deformities of the valves.

Supraventricular tachycardia (Choice D) is the most common form of fetal tachyarrhythmia and may affect fetuses with and without congenital heart disease. It is not associated with SLE.

Ventricular septal defect (Choice E) is the most common congenital heart defect. It is associated with Down syndrome, thymic aplasia (DiGeorge syndrome), Turner syndrome, and tetralogy of Fallot.

Educational Objective: Congenital AV block is a rare complication that can affect children born to mothers with SLE or Sjögren syndrome as a result of exposure of the developing fetal AV node and myocardium to maternal autoantibodies.

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1. A 9-month-old boy is brought to the physician by his mother for a well-child examination. She is concerned because over the past 4 weeks, her son has cried, screamed, and rubbed his ears whenever one of her friends holds him. She is the only person who can console him, and it now takes longer to soothe him. He was previously a happy, easygoing baby. When the physician approaches him, he begins to cry. He is at the 50th percentile for height and 75th percentile for weight. Examination shows no abnormalities except for clear rhinorrhea. He sits up independently, pulls himself to standing, and crawls along furniture. Which of the following is the most appropriate next step in management?

A) Reassure his mother that this is age-appropriate behavior
B) Notify child protective services of possible abuse by one of his mother's friends
C) Order a CT scan of the head
D) Begin amoxicillin therapy
E) Begin low-dose lorazepam therapy

Correct Answer: A.

This child is demonstrating age-appropriate behavior. Infants demonstrate fear in response to strangers beginning at age 6 months and peaking from 7 to 10 months, which is typically manifest as crying or screaming. Screening for developmental milestone achievement is an important element of well-child examinations. Gross motor, fine motor, cognitive, social, and language milestones should be evaluated. While there is a wide range of normal presentations, at age 9 months, most infants have acquired gross motor milestones including sitting without assistance, crawling on hands and knees, and pulling to standing. Fine motor skills such as grasping objects with two fingers and a thumb are also typically present. Social and language skills at age 9 months typically include using sounds to get attention and imitating sounds made by adults.

Incorrect Answers: B, C, D, and E.

Notifying child protective services of possible abuse by one of his mother's friends (Choice B) is not appropriate in this case. Fear is a normal infant response to strangers, which becomes more prominent between 7 and 10 months of age. Abuse should be suspected when the history and physical examination are discordant, the history is not consistent with the developmental age of the child, or appropriate medical care is delayed.

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E) Begin low-dose lorazepam therapy

Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Notifying child protective services of possible abuse by one of his mother's friends (Choice B) is not appropriate in this case. Fear is a normal infant response to strangers, which becomes more prominent between 7 and 10 months of age. Abuse should be suspected when the history and physical examination are discordant, the history is not consistent with the developmental age of the child, or appropriate medical care is delayed.

Ordering a CT scan of the head (Choice C) is unnecessary since the patient has no symptoms to suggest an intracranial pathology.

Beginning amoxicillin therapy (Choice D) is not appropriate at this time. While ear pulling or rubbing in infants and toddlers may indicate ear pain and the presence of otitis media, the behavior in this case is paired with other signs of fear of strangers. This is a normal response to strangers, which is developmentally appropriate for this child's age.

Beginning low-dose lorazepam therapy (Choice E) is inappropriate in this case since the child's symptoms are a normal demonstration of fear of strangers rather than evidence of anxiety or panic disorder.

Educational Objective: Stranger anxiety is a normal developmental milestone for infants, which typically becomes most prominent between 7 to 10 months. Infants demonstrate fear in response to strangers, which is typically manifest as crying or screaming. Screening for developmental milestone achievements is an important element of well-child examinations.

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2. A previously healthy 27-year-old woman comes to the emergency department because of a "crawling" sensation over her skin that began 1 hour ago after she ate a candy bar containing peanuts. She has a peanut allergy but did not realize the bar contained peanuts. She says that she used an epinephrine auto-injector as soon as symptoms developed but still does not feel well. She notes that her lips have become swollen and feel especially "itchy and tingly." She has had three episodes of diarrhea. She appears flushed. Her temperature is 37°C (98.6°F), pulse is 120/min, respirations are 27/min, and blood pressure is 85/42 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. Examination shows slightly swollen lips and cheeks and erythematous areas over the face and extremities. Breath sounds are decreased, and expiratory wheezes are heard throughout the lungs. An ECG shows sinus tachycardia. In addition to epinephrine, which of the following should be administered?

A) Dopamine
B) Phenylephrine
C) 0.9% Saline
D) Theophylline
E) Vasopressin

Correct Answer: C.

0.9% saline should be given in addition to epinephrine to this patient with evidence of anaphylaxis. The patient has a known peanut allergy and a recent exposure to peanuts. Her symptoms of diarrhea, flushing, swelling of the lips, and vital sign derangements, including hypotension, hypoxia, and tachycardia are all classic symptoms of anaphylaxis. Anaphylactic shock is a form of distributive shock, which is characterized by a primary reduction in the systemic vascular resistance (SVR). This reduction in SVR is secondary to IgE-mediated histamine and cytokine release. Cardiac output increases to compensate for low SVR in the early stages of distributive shock, but if the inciting state is not appropriately treated, further decompensation can occur, resulting in progressive hypotension and insufficient perfusion with end-organ damage. Epinephrine is the treatment of choice and acts to constrict the arteries and arterioles, thereby increasing the blood pressure, but also acts to reverse laryngeal edema and to dilate the bronchioles. Adjunctive treatment with isotonic fluids such as 0.9% saline is indicated in order to increase preload and restore normal circulating volume.

Incorrect Answers: A, B, D, and E.

Dopamine (Choice A) is a vasopressor medication that is sometimes used as an adjunct in cardiogenic shock, but it can paradoxically cause hypotension and also

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E) Vasopressin

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Dopamine (Choice A) is a vasopressor medication that is sometimes used as an adjunct in cardiogenic shock, but it can paradoxically cause hypotension and also increases the risk for arrhythmias. It is not used to treat anaphylaxis.

Phenylephrine (Choice B) is a pure α-adrenergic agonist that functions to constrict peripheral arterioles and thereby increase blood pressure. Unlike epinephrine, it does not provide any relief of upper airway edema or bronchoconstriction.

Theophylline (Choice D) is an older medication with a narrow therapeutic window that used to be used frequently to treat asthma. It has generally fallen out of favor and is not considered a first-line therapy for anaphylaxis.

Vasopressin (Choice E) acts on the V_1 receptor to increase SVR and thereby increase the blood pressure. It is a useful medication for vasodilatory shock, but epinephrine is considered first-line for anaphylaxis.

Educational Objective: Anaphylaxis should be suspected in patients with a known food allergy and a recent exposure who present with vasodilatory shock. Prompt treatment with epinephrine and isotonic fluids should be initiated to restore circulating volume, increase blood pressure, and reverse laryngeal edema and bronchial constriction.

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3. A previously healthy 27-year-old woman is brought to the emergency department 48 hours after the onset of confusion. She has a 1-week history of temperatures to 39.3°C (102.8°F) and yellow eyes. Her only medication is an oral contraceptive. She is oriented to person but not to place or time. Her temperature now is 38.6°C (101.5°F), pulse is 110/min, respirations are 18/min, and blood pressure is 110/70 mm Hg. Examination shows scleral icterus and scattered petechiae over the trunk and lower extremities. Laboratory studies show:

Hematocrit	25%
Leukocyte count	13,000/mm^3
Platelet count	11,000/mm^3
Prothrombin time	11 sec (INR=1.0)
Partial thromboplastin time	30 sec
Serum	
Creatinine	4.5 mg/dL
Bilirubin, total	6 mg/dL
Direct	0.9 mg/dL

Which of the following is the most appropriate next step in management?

A) Aspirin therapy
B) Immune globulin therapy
C) Glucocorticoid therapy
D) Plasmapheresis
E) Splenectomy

Correct Answer: D.

Plasmapheresis is the most appropriate next step in management of this patient who most likely has thrombotic thrombocytopenic purpura (TTP). TTP is a life-threatening condition that results in rapid death if not recognized and treated. It is a thrombotic microangiopathy that occurs as a result of inhibition or deficiency of ADAMTS13, a

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E) Splenectomy

Correct Answer: D.

Plasmapheresis is the most appropriate next step in management of this patient who most likely has thrombotic thrombocytopenic purpura (TTP). TTP is a life-threatening condition that results in rapid death if not recognized and treated. It is a thrombotic microangiopathy that occurs as a result of inhibition or deficiency of ADAMTS13, a metalloprotease that degrades von Willebrand factor (vWF) multimers. vWF is a circulating protein that aids in platelet adhesion and aggregation. Inappropriate activation with impaired degradation leads to the formation of large vWF multimer complexes that obstruct the arterioles and cause mechanical trauma to passing erythrocytes. Intravascular hemolysis results in anemia while consumption of platelets leads to thrombocytopenia. End organ damage is also frequently seen as thrombi can obstruct arterioles. The classic presentation includes the abrupt onset of fever, anemia, thrombocytopenia, renal failure, and neurologic symptoms. Increased indirect bilirubin and jaundice indicate hemolysis, not liver disease. Importantly, patients with TTP will have normal coagulation studies since the disease process does not involve consumption of coagulation factors or activation of the coagulation cascade. While TTP can be hereditary, it is more commonly a result of an autoantibody inhibitor against ADAMTS13, so treatment is with urgent plasmapheresis to remove the circulating antibody.

Incorrect Answers: A, B, C, and E.

Aspirin therapy (Choice A) is indicated in patients with evidence of myocardial ischemia or infarction, which presents with ischemia and typical ECG changes. Aspirin would not be helpful in this patient.

Immune globulin therapy (Choice B) has little to no benefit in the treatment of TTP.

Glucocorticoid therapy (Choice C) is frequently added as an adjunctive medication to theoretically decrease the production of antibodies against ADAMTS13, but it should not be substituted in place of plasmapheresis.

Splenectomy (Choice E) is sometimes indicated for the treatment of immune thrombocytopenic purpura, not TTP.

Educational Objective: TTP usually results from the development of an antibody against ADAMTS13, a metalloprotease that cleaves vWF multimers and prevents overwhelming platelet aggregation and clot formation. Deficiency of ADAMTS13 leads to microangiopathic hemolytic anemia. Other symptoms of TTP include renal failure from microthrombi, fever, thrombocytopenia, and neurologic symptoms. Treatment is with plasmapheresis to remove the circulating autoantibody.

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4. A 9-year-old girl is brought to the physician by her parents because of increasingly strange behavior during the past 6 months. They report that she touches and smells household objects and repeatedly turns the lights on and off in her room. She has been worried because of frequent thoughts of her dog being hit by a car and her parents being involved in a motor vehicle collision even though these things have never happened. She has begun to tap her foot three times when she experiences these thoughts to prevent them from happening. Physical examination shows no abnormalities. Mental status examination shows an anxious mood and a constricted affect. Which of the following is the most appropriate pharmacotherapy?

A) Clonidine
B) Clozapine
C) Dextroamphetamine
D) Haloperidol
E) Naloxone
F) Nortriptyline
G) Sertraline

Correct Answer: G.

Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). By definition, the compulsions are excessive or do not realistically address the obsessive fears, and patients commonly recognize the irrationality of their compulsions. Treatment includes high doses of selective serotonin reuptake inhibitors (SSRIs, eg, sertraline) or cognitive behavioral therapy (CBT) with a focus on exposure to the discomfort of suppressing the compulsion after experiencing the obsession. SSRIs have the lowest adverse effect burden of antidepressant medications. Clomipramine (a tricyclic antidepressant) and venlafaxine (a selective serotonin-norepinephrine reuptake inhibitor antidepressant) are effective second-line agents.

Incorrect Answers: A, B, C, D, E, and F.

Clonidine (Choice A) is an α-adrenergic agonist that leads to decreased sympathetic outflow from the brain. It is commonly used to treat attention deficit/hyperactivity

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Correct Answer: G.

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Incorrect Answers: A, B, C, D, E, and F.

Clonidine (Choice A) is an α_2-adrenergic agonist that leads to decreased sympathetic outflow from the brain. It is commonly used to treat attention-deficit/hyperactivity disorder (ADHD) and is also used off-label to treat acute anxiety on an as-needed basis. It is not commonly used as a long-term anxiety disorder treatment.

Clozapine (Choice B) is an atypical antipsychotic medication used in treatment-refractory schizophrenia. Serious adverse effects such as agranulocytosis, myocarditis, and seizures prohibit its use in OCD.

Dextroamphetamine (Choice C) is a stimulant medication used in ADHD. It is not useful in OCD.

Haloperidol (Choice D) is a typical antipsychotic medication used to treat schizophrenia and acute agitation. It is not effective in OCD.

Naloxone (Choice E) is a short-acting opioid antagonist used to reverse opioid overdose. It has no use in OCD.

Nortriptyline (Choice F) is a tricyclic antidepressant used for some depressive and anxiety disorders without proven efficacy for OCD. It is associated with an increased adverse effect burden compared with SSRIs (eg, anticholinergic adverse effects).

Educational Objective: OCD is an anxiety disorder typically characterized by obsessions (intrusive thoughts) that the patient attempts to neutralize with compulsions (repetitive behaviors). First-line treatment of OCD includes high doses of SSRIs or CBT.

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5. A 44-year-old man comes to the office with his girlfriend because she is concerned about his mood. He recently told her it would be a relief if he were hit by a truck and died. He reports frequent fatigue and says he has been persistently unhappy for 9 years. He has not had problems with sleep or appetite. He has type 1 diabetes mellitus, chronic kidney disease, hypertension, and peripheral neuropathy. His medications are furosemide, gabapentin, insulin, metoprolol, and simvastatin. He lost joint custody of his two children 1 month ago, which he says is "a real downer." He finds his work as a convenience store clerk tedious and uninteresting, but he enjoys playing poker and watching movies. He has used cocaine once monthly during the past 5 years. His pulse is 84/min, and blood pressure is 146/88 mm Hg. Physical examination shows retinal hemorrhages. On mental status examination, he has a dysphoric mood and sarcastic affect. There is evidence of interpersonal friction with his girlfriend. He reports no current suicidal ideation or intent. Which of the following is the most likely diagnosis?

A) Adjustment disorder with depressed mood
B) Borderline personality disorder
C) Major depressive disorder
D) Persistent depressive disorder (dysthymia)
E) Substance-induced mood disorder

Correct Answer: D.

Persistent depressive disorder, previously called dysthymia, refers to at least three depression symptoms that have endured for at least 2 years. By definition, patients must experience a depressed mood on more days than not. Other symptoms of persistent depressive disorder include neurovegetative symptoms (decreased energy, sleep disturbances, appetite disturbances), impaired concentration, low self-esteem, and hopelessness. By definition, persistent depressive disorder symptoms must lead to clinically significant distress or impaired social or occupational functioning (eg, interpersonal friction). Emerging evidence indicates that persistent depressive disorder should be managed similarly to major depressive disorder: antidepressant medication plus psychotherapy is most effective. Selective serotonin reuptake inhibitors are generally the first-line medications given their low adverse effect burden.

Incorrect Answers: A, B, C, and E.

Adjustment disorder with depressed mood (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated depressive

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Correct Answer: D.

Persistent depressive disorder, previously called dysthymia, refers to at least three depression symptoms that have endured for at least 2 years. By definition, patients must experience a depressed mood on more days than not. Other symptoms of persistent depressive disorder include neurovegetative symptoms (decreased energy, sleep disturbances, appetite disturbances), impaired concentration, low self-esteem, and hopelessness. By definition, persistent depressive disorder symptoms must lead to clinically significant distress or impaired social or occupational functioning (eg, interpersonal friction). Emerging evidence indicates that persistent depressive disorder should be managed similarly to major depressive disorder: antidepressant medication plus psychotherapy is most effective. Selective serotonin reuptake inhibitors are generally the first-line medications given their low adverse effect burden.

Incorrect Answers: A, B, C, and E.

Adjustment disorder with depressed mood (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated depressive symptoms. This patient's depressed mood preceded the stressor of losing custody of his children.

Borderline personality disorder (Choice B) is a cluster B personality disorder, the emotional or dramatic cluster, that features an unstable sense of self, unstable emotions, and tumultuous relationships. Though this patient's depressed mood is causing relationship difficulty, he does not have a history of tumultuous relationships. As well, his mood has been persistently depressed rather than unstable.

Major depressive disorder (Choice C) presents with 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, or appetite disturbance. This patient endorses fewer than five depressive symptoms.

Substance-induced mood disorder (Choice E) refers to mood disturbance that developed during or within a month of intoxication with or withdrawal from a substance. This patient's depressed mood preceded his cocaine use and therefore is unlikely to be secondary to cocaine use.

Educational Objective: Persistent depressive disorder refers to at least three depression symptoms (including depressed mood during more days than not) that have endured for at least 2 years. Other symptoms of persistent depressive disorder include neurovegetative symptoms (decreased energy, sleep disturbances, appetite disturbances), impaired concentration, low self-esteem, and hopelessness.

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6. A 14-year-old boy is brought to the physician by his parents because he has been increasingly irritable, disrespectful, and uncooperative during the past 4 years. He refuses to do any household chores and does not obey curfew. He may be expelled from school because he is rude and threatening to teachers and has been cutting classes. He is tutored for reading but earns C's and D's in his classes. He has been suspended three times during the past year for talking back to his teachers. He repeated first grade due to poor academic readiness. He used to have trouble with homework but now he does not complete any homework. He is at the 65th percentile for height and 50th percentile for weight. Physical examination shows no abnormalities. During the examination, the patient is minimally cooperative and frequently rolls his eyes at questions. Urine toxicology screening is positive for nicotine. Which of the following is the most likely explanation for this patient's behavior?

A) Attention-deficit/hyperactivity disorder
B) Borderline cognitive functioning
C) Conduct disorder
D) Oppositional defiant disorder
E) Reading disorder
F) Normal adolescent behavior

Correct Answer: D.

Oppositional defiant disorder is a childhood disruptive behavior disorder that manifests as a persistent pattern of angry/irritable mood, defiant behavior (eg, arguing with or defying authority figures, blaming others for their own mistakes), and vindictiveness. These behaviors cause dysfunction in the patient's immediate social context (most commonly with family members) or lead to educational or occupational dysfunction. This patient demonstrates defiant behavior toward his parents, teachers, and the physician. Oppositional defiant disorder commonly arises from a combination of genetic factors, an irritable temperament, and sometimes a harsh parenting style. Comorbid attention-deficit/hyperactivity disorder, learning disorders, anxiety disorders, and substance use disorders are common. Management is multimodal and includes parent management training (teaching parents to reinforce positive and punish negative behaviors), school-based interventions, and individual anger management therapy.

Incorrect Answers: A, B, C, E, and F.

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F) Normal adolescent behavior

Correct Answer: D.

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Incorrect Answers: A, B, C, E, and F.

Attention-deficit/hyperactivity disorder (Choice A) presents with chronic symptoms of hyperactivity/impulsivity and/or inattention that occur in more than one setting and impair academic, social, and/or emotional function. This patient's behavior is predominantly defiant rather than hyperactive or inattentive.

Borderline cognitive functioning (Choice B), also known as borderline intellectual functioning, refers to intellectual functioning between normal intellect and intellectual disability. Reading disorder (Choice E), a type of specific learning disorder, refers to impairment in the specific academic skill of reading. Patients with borderline cognitive functioning or reading disorder do not typically demonstrate a pervasive pattern of defiant behavior.

Conduct disorder (Choice C) refers to a persistent pattern of violating others' rights, including aggression, deceitful behaviors, and property destruction. This patient's behavior is defiant but not physically aggressive or in violation of others' basic human rights.

Normal adolescent behavior (Choice F) frequently includes a degree of defiance but not the pervasive pattern of defiance and related social and academic dysfunction demonstrated by this patient.

Educational Objective: Oppositional defiant disorder manifests as a persistent pattern of angry/irritable mood, defiant behavior, and vindictiveness that causes social, academic, or occupational dysfunction. Treatment commonly includes parent management training.

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7. A 72-year-old man comes to the physician because of a 2-year history of increasingly severe episodic pain in both legs. The pain is triggered by walking and increases as he walks longer distances. He also has weakness and numbness in both legs when he walks farther than 4 blocks. He says that he now has difficulty walking through the grocery store, but the pain decreases when he leans forward on the cart while walking. He has no history of serious illness and takes no medications. Vital signs are within normal limits. Muscle strength and deep tendon reflexes are normal, and sensation is intact. Femoral, posterior tibial, and pedal pulses are equal bilaterally. The remainder of the examination shows no abnormalities. Which of the following is the most likely cause of this patient's symptoms?

A) Lower extremity arterial insufficiency
B) Lower extremity venous insufficiency
C) Lumbar degenerative joint disease
D) Lumbar disc herniation
E) Lumbar spinal stenosis

Correct Answer: E.

Lumbar spinal stenosis refers to the narrowing of the lumbar spinal canal, which results in compression of the lumbar nerve roots or spinal cord. Patients may present with symptoms of radiculopathy, including back pain that radiates to the buttocks and legs, leg numbness, paresthesia, and/or weakness. Hip extension increases pressure on the nerve roots, while flexion of the hips relieves pressure. Consequently, patients may demonstrate neurogenic claudication, in which extension of the hips (eg, standing or walking downhill) leads to symptoms. The most common cause of lumbar spinal stenosis is degenerative joint disease and osteophytosis, which often occurs with advanced age. The diagnosis is confirmed by MRI. Treatment involves nonsteroidal anti-inflammatory drugs, physical therapy, and surgery.

Incorrect Answers: A, B, C, and D.

Lower extremity arterial insufficiency (Choice A) may lead to claudication (pain associated with exertion) of the distal lower extremities that improves with rest. However, patients demonstrate diminished lower extremity pulses along with lower extremity hair loss on examination. As well, hip/spine flexion would not typically resolve the pain nor would extension worsen it.

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E) Lumbar spinal stenosis

Correct Answer: E.

Lumbar spinal stenosis refers to the narrowing of the lumbar spinal canal, which results in compression of the lumbar nerve roots or spinal cord. Patients may present with symptoms of radiculopathy, including back pain that radiates to the buttocks and legs, leg numbness, paresthesia, and/or weakness. Hip extension increases pressure on the nerve roots, while flexion of the hips relieves pressure. Consequently, patients may demonstrate neurogenic claudication, in which extension of the hips (eg, standing or walking downhill) leads to symptoms. The most common cause of lumbar spinal stenosis is degenerative joint disease and osteophytosis, which often occurs with advanced age. The diagnosis is confirmed by MRI. Treatment involves nonsteroidal anti-inflammatory drugs, physical therapy, and surgery.

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Lower extremity arterial insufficiency (Choice A) may lead to claudication (pain associated with exertion) of the distal lower extremities that improves with rest. However, patients demonstrate diminished lower extremity pulses along with lower extremity hair loss on examination. As well, hip/spine flexion would not typically resolve the pain nor would extension worsen it.

Lower extremity venous insufficiency (Choice B) commonly presents with lower extremity edema, ulceration, darkened skin, and varicose veins. Claudication (pain associated with exertion) is not characteristic.

Lumbar degenerative joint disease (Choice C) refers to degenerative changes at the facet joints. These degenerative changes sometimes lead to displacement of a vertebral body, known as spondylolisthesis, which is a common cause of lumbar spinal stenosis. However, lumbar stenosis is the most direct cause of the patient's symptoms.

Lumbar disc herniation (Choice D), or dislocation of the nucleus pulposus, manifests with back pain and paresthesia, numbness, pain, and/or weakness of the lower extremities or within the distribution of an affected nerve root. Symptoms commonly improve with spine extension (eg, standing or walking) and worsen with spine flexion.

Educational Objective: Lower extremity pain that is exacerbated by extension of the hip and spinal column and relieved by flexion is suggestive of neurogenic claudication resulting from spinal stenosis. Positional changes in symptoms and the absence of diminished pulses or lower extremity skin changes distinguishes neurogenic claudication from claudication secondary to vascular insufficiency.

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8. An 11-year-old boy is brought to the office by his mother as a new patient because of a 3-year history of increasing weakness of his arms and legs. His mother says the weakness is now interfering with her son's ability to participate in physical education classes at school. He has no history of serious illness and receives no medications. His older sister is healthy. He has several male and female cousins who are uncoordinated and fall frequently. Examination of the patient shows scoliosis of the thoracic and lumbosacral spine. There is atrophy and muscle weakness of both shoulders and pelvic girdles. Deep tendon reflexes are trace throughout. Sensation is intact throughout. His gait is waddling, and he must extend his back to walk smoothly. Results of a complete blood count and serum electrolyte concentrations are within the reference ranges. His serum creatine kinase activity is 387 U/L. Which of the following is the most likely diagnosis?

A) Duchenne muscular dystrophy
B) Juvenile spinal muscular atrophy
C) Myasthenia gravis
D) Myotonic dystrophy type 2
E) Polymyositis

Correct Answer: B.

Spinal muscular atrophy (SMA) is a group of autosomal recessive disorders caused by mutations in SMN genes at chromosome 5q13 that lead to the degeneration of motor neurons, resulting in progressive hypotonia and areflexia. In type I, infantile-onset SMA (Werdnig-Hoffman disease), patients exhibit difficulty with mobility, respiratory distress and difficulty feeding, typically leading to death from respiratory failure during infancy. Patients with type II, intermediate SMA (Dubowitz disease), never gain the ability to stand or walk without assistance. This patient's history of previously independent ambulation followed by increasing difficulty with ambulation is characteristic of type III, juvenile SMA, also known as Kugelberg-Welander syndrome. Type III SMA presents at a later age with proximal muscle weakness affecting both the arms and legs. Many patients become wheelchair-dependent, and some may develop skeletal abnormalities, such as scoliosis or lumbar hyperlordosis. Most patients live a normal lifespan, in contrast to infantile SMA. Patients may require physical and respiratory therapy.

Incorrect Answers: A, C, D, and E.

Duchenne muscular dystrophy (Choice A) results from mutation in the dystrophin gene and is inherited in X-linked recessive fashion. It presents with proximal muscle

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D) Myotonic dystrophy type 2

E) Polymyositis

Correct Answer: B.

Spinal muscular atrophy (SMA) is a group of autosomal recessive disorders caused by mutations in SMN genes at chromosome 5q13 that lead to the degeneration of motor neurons, resulting in progressive hypotonia and areflexia. In type I, infantile-onset SMA (Werdnig-Hoffman disease), patients exhibit difficulty with mobility, respiratory distress and difficulty feeding, typically leading to death from respiratory failure during infancy. Patients with type II, intermediate SMA (Dubowitz disease), never gain the ability to stand or walk without assistance. This patient's history of previously independent ambulation followed by increasing difficulty with ambulation is characteristic of type III, juvenile SMA, also known as Kugelberg-Welander syndrome. Type III SMA presents at a later age with proximal muscle weakness affecting both the arms and legs. Many patients become wheelchair-dependent, and some may develop skeletal abnormalities, such as scoliosis or lumbar hyperlordosis. Most patients live a normal lifespan, in contrast to infantile SMA. Patients may require physical and respiratory therapy.

Incorrect Answers: A, C, D, and E.

Duchenne muscular dystrophy (Choice A) results from mutation in the dystrophin gene and is inherited in X-linked recessive fashion. It presents with proximal muscle weakness and hyperlordosis, but typically presents in toddlers with calf pseudohypertrophy and Gower sign.

Myasthenia gravis (Choice C) may present with proximal muscle weakness but is typically accompanied by ocular and bulbar symptoms, such as ptosis, diplopia, and dysphagia.

Myotonic dystrophy type 2 (Choice D) typically presents in adults with myotonia, the impairment of muscular relaxation, diffuse muscular weakness, and cataracts. Myotonia is easily elicited by a handshake or by having the patient grip the examiner's fingers.

Polymyositis (Choice E) is an inflammatory myopathy that presents with proximal muscle pain and weakness. Polymyositis does not typically present with areflexia.

Educational Objective: Type III SMA, or juvenile SMA, also known as Kugelberg-Welander syndrome, results from *SMN* mutations at 5q13 and is characterized by the ability to achieve independent ambulation for a period of life, followed by the progressive loss of ambulation as a result of motor neuron degeneration and proximal muscle weakness. Many patients require physical therapy and mobility assistance but live a normal lifespan.

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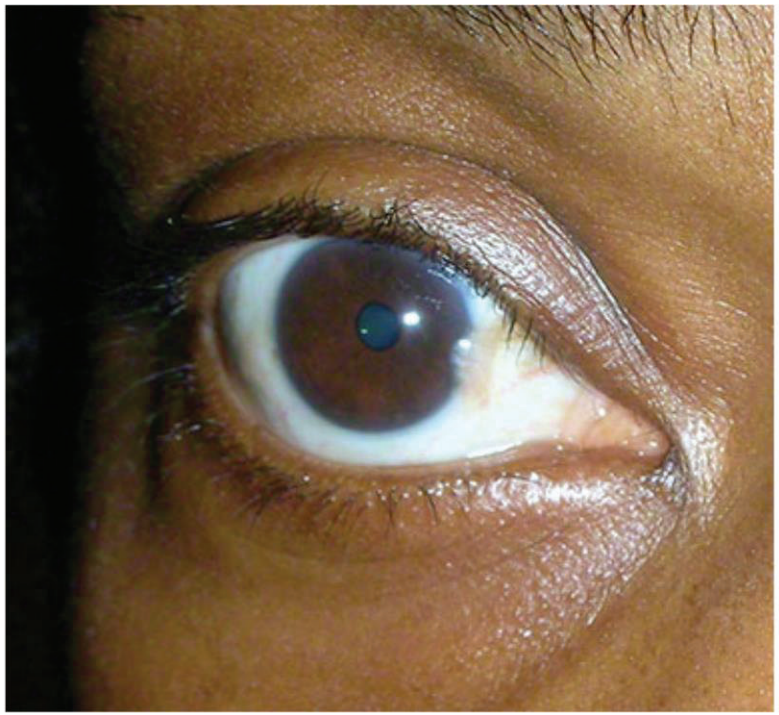
9. A 32-year-old woman comes to the office for a health maintenance examination. She feels well. She has mild myopia and wears contact lenses. She has no history of serious illness and takes no medications. She appears well. Vital signs are within normal limits. A photograph of the right eye is shown. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?



A) Incision and drainage
B) Recommendation that she wear sunglasses
C) Serum antinuclear antibody assay
D) Surgical excision
E) Use of antibiotic eye drops

Correct Answer: B.

A pterygium is a benign growth of conjunctival tissue that occurs in the limbal conjunctiva within the interpalpebral fissure, most often nasally. Pterygia derive their name from the Greek *pterygos*, or "wing," for their wing-like appearance. Histologically, pterygia are characterized by degeneration of subepithelial tissue, fibrovascular proliferation with destruction of the corneal Bowman membrane, and elastotic degeneration. Pterygia are caused by environmental hazards such as ultraviolet radiation, hot and dry climates, dust, and wind. The diagnosis is clinical, and biopsy is not typically required. Patients typically present with symptoms of irritation, redness, foreign body sensation, or blurry vision as a result of obstruction of the visual axis and induction of irregular astigmatism by the pterygium. Treatment includes topical lubrication and reduction of ultraviolet light exposure by wearing sunglasses while outdoors. Pterygia may slowly expand over time and extend over the cornea. Patients with intolerable symptoms, visual disturbance, or unacceptable cosmetic appearance may require surgical excision. Surgical excision involves complete excision of the

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Incorrect Answers: A, C, D, and E.

Incision and drainage (Choice A) is not necessary, since pterygia do not typically contain a fluid component.

Serum antinuclear antibody assay (Choice C) is not useful for the evaluation of pterygia. Pterygia are not associated with autoimmune disease.

Surgical excision (Choice D) is a reasonable and commonly employed treatment option for pterygia. However, surgical excision exposes the patient to risk and a prolonged recovery period (typically several weeks), and it is only warranted in cases with intolerable symptoms, visual disturbance, or unacceptable cosmetic appearance. Conservative treatment with topical lubrication and sunglasses is a more reasonable initial approach for the majority of patients.

Use of antibiotic eye drops (Choice E) are not helpful in the treatment of pterygia. Pterygia are not associated with conjunctival infection.

Educational Objective: A pterygium is a benign growth of conjunctival tissue that occurs in the limbal conjunctiva within the interpalpebral fissure, most often nasally, and is thought to be caused by exposure to environmental hazards such as ultraviolet radiation, hot and dry climates, dust, and wind. Treatment includes topical lubrication and

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Correct Answer: B.

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Use of antibiotic eye drops (Choice E) are not helpful in the treatment of pterygia. Pterygia are not associated with conjunctival infection.

Educational Objective: A pterygium is a benign growth of conjunctival tissue that occurs in the limbal conjunctiva within the interpalpebral fissure, most often nasally, and is thought to be caused by exposure to environmental hazards such as ultraviolet radiation, hot and dry climates, dust, and wind. Treatment includes topical lubrication and reduction of ultraviolet light exposure by wearing sunglasses while outdoors.

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10. A 4-year-old boy is brought to the physician because of a lesion on his scalp for the past 6 weeks. It has continued to increase in size despite use of over-the-counter antibacterial creams and 7 days of oral cephalexin that his mother had leftover from a previous illness. The lesion began as a round area approximately the size of a quarter. He has no history of serious illness. A photograph of the lesion is shown. Infection with which of the following is the most likely cause of this patient's lesion?

A) *Microsporum gypseum*

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10. A 4-year-old boy is brought to the physician because of a lesion on his scalp for the past 6 weeks. It has continued to increase in size despite use of over-the-counter antibacterial creams and 7 days of oral cephalexin that his mother had leftover from a previous illness. The lesion began as a round area approximately the size of a quarter. He has no history of serious illness. A photograph of the lesion is shown. Infection with which of the following is the most likely cause of this patient's lesion?

A) *Microsporum gypseum*
B) *Mycobacterium ulcerans*
C) *Pseudomonas aeruginosa*
D) *Staphylococcus aureus*
E) *Streptococcus pyogenes* (group A)

Correct Answer: A

Infection with *Microsporum gypseum* is the most likely cause of the patient's lesion, which is consistent with a diagnosis of tinea capitis. Tinea capitis is a fungal infection of the scalp that is common in children. The most common presentation is scaly patches with alopecia and concomitant lymphadenopathy. The patches of alopecia may also demonstrate black dots that represent broken hairs or pustules. When a significant inflammatory response to the fungal infection develops, a kerion develops. This is indicated by a boggy texture and swollen appearance on examination, which is present in this case. Tinea capitis is caused by dermatophytes including *Trichophyton tonsurans*, *Epidermophyton floccosum*, *Microsporum canis*, and *Microsporum gypseum*. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine. Both griseofulvin and terbinafine have a risk for hepatotoxicity. Patients and their parents should be counseled to monitor for signs of liver damage including right upper quadrant abdominal pain, severe pruritus, jaundice, or scleral icterus, though routine laboratory work is not indicated. Additionally, close contacts of patients should also be examined since tinea capitis is very contagious and can be spread through fomites, such as shared combs, pillows, or hats.

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C) *Pseudomonas aeruginosa*

D) *Staphylococcus aureus*

E) *Streptococcus pyogenes* (group A)

Correct Answer: A

Infection with *Microsporum gypseum* is the most likely cause of the patient's lesion, which is consistent with a diagnosis of tinea capitis. Tinea capitis is a fungal infection of the scalp that is common in children. The most common presentation is scaly patches with alopecia and concomitant lymphadenopathy. The patches of alopecia may also demonstrate black dots that represent broken hairs or pustules. When a significant inflammatory response to the fungal infection develops, a kerion develops. This is indicated by a boggy texture and swollen appearance on examination, which is present in this case. Tinea capitis is caused by dermatophytes including *Trichophyton tonsurans*, *Epidermophyton floccosum*, *Microsporum canis*, and *Microsporum gypseum*. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine. Both griseofulvin and terbinafine have a risk for hepatotoxicity. Patients and their parents should be counseled to monitor for signs of liver damage including right upper quadrant abdominal pain, severe pruritus, jaundice, or scleral icterus, though routine laboratory work is not indicated. Additionally, close contacts of patients should also be examined since tinea capitis is very contagious and can be spread through fomites, such as shared combs, pillows, or hats.

Incorrect Answers: B, C, D, and E.

Mycobacterium ulcerans (Choice B) is the third most common cause of mycobacterial infections after tuberculosis and leprosy. *M. ulcerans* causes a Buruli ulcer, which starts as a painless nodule on the head, neck, trunk, or genitals, and later ulcerates. *M. ulcerans* commonly affects children from West African countries and is rarely seen in the United States. In contrast, tinea capitis is a common dermatosis in childhood.

Pseudomonas aeruginosa (Choice C), *Staphylococcus aureus* (Choice D) and *Streptococcus pyogenes* (group A) (Choice E) are common bacterial causes of cutaneous infections. *S. aureus* and *S. pyogenes* typically cause impetigo, folliculitis, cellulitis, and erysipelas, while *P. aeruginosa* causes hot tub folliculitis, ecthyma gangrenosum, otitis externa, and acute paronychia. However, tinea capitis is a fungal infection, not a bacterial infection.

Educational Objective: Tinea capitis is a fungal infection of the scalp that is common in children and typically causes patches of alopecia with concomitant lymphadenopathy. Tinea capitis is caused by dermatophytes including *Trichophyton tonsurans*, *Epidermophyton floccosum*, *Microsporum canis*, and *Microsporum gypseum*. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine.

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11. A 67-year-old man comes to the emergency department because of a 2-day history of fever and progressive pain in his right knee. He says that he had a cold 5 days ago. He has end-stage renal failure secondary to type 2 diabetes mellitus and has required hemodialysis for the past 2 years. Current medications include insulin, erythropoietin, and a daily multivitamin. His temperature is 37.9°C (100.2°F). The right knee is swollen and warm. Range of motion is severely limited due to pain. The remainder of the examination shows no abnormalities. Which of the following is the most likely cause of this patient's current symptoms?

A) Hematogenous infection
B) Hemochromatosis
C) Human leukocyte antigen-B27 haplotype
D) Sequelae of a viral upper respiratory tract infection
E) Uremia

Correct Answer: A.

Hematogenous infection of this patient's right knee leading to septic arthritis is the most likely diagnosis. Septic arthritis classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. Septic arthritis results from a bacterial infection of the synovial joint space, most commonly by *Staphylococcus aureus*. Arthrocentesis is requisite and often discloses synovial fluid with greater than 50,000 leukocytes/mm^3. Serum tests may also demonstrate leukocytosis and increased inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Treatment involves urgent intravenous antibiotics and source control, with patients often requiring irrigation of the joint in the operating room. Empiric antibiotic therapy with vancomycin should be given to cover for methicillin-resistant *S. aureus* while a second medication such as a penicillin or cephalosporin is often given to provide adequate coverage for less common pathogens or susceptible strains of *S. aureus*. Risk factors for infection include concurrent or recent skin or soft-tissue infection, diabetes, rheumatoid arthritis, and injection drug use.

Incorrect Answers: B, C, D, and E.

Hemochromatosis (Choice B) describes a disease process by which iron is deposited in various organs and tissues. It can present with cirrhosis, diabetes, or joint pain. Classically, hemochromatosis affects the joints of the hands. It does not present with fevers and an acutely swollen, erythematous joint.

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Hematogenous infection of this patient's right knee leading to septic arthritis is the most likely diagnosis. Septic arthritis classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. Septic arthritis results from a bacterial infection of the synovial joint space, most commonly by *Staphylococcus aureus*. Arthrocentesis is requisite and often discloses synovial fluid with greater than 50,000 leukocytes/mm^3. Serum tests may also demonstrate leukocytosis and increased inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Treatment involves urgent intravenous antibiotics and source control, with patients often requiring irrigation of the joint in the operating room. Empiric antibiotic therapy with vancomycin should be given to cover for methicillin-resistant *S. aureus* while a second medication such as a penicillin or cephalosporin is often given to provide adequate coverage for less common pathogens or susceptible strains of *S. aureus*. Risk factors for infection include concurrent or recent skin or soft-tissue infection, diabetes, rheumatoid arthritis, and injection drug use.

Incorrect Answers: B, C, D, and E.

Hemochromatosis (Choice B) describes a disease process by which iron is deposited in various organs and tissues. It can present with cirrhosis, diabetes, or joint pain. Classically, hemochromatosis affects the joints of the hands. It does not present with fevers and an acutely swollen, erythematous joint.

Human leukocyte antigen-B27 haplotype (HLA-B27) (Choice C) is frequently found to be positive in patients with seronegative arthropathies such as ankylosing spondylitis, but there are also numerous healthy individuals who are positive for HLA-B27. It is a laboratory marker and does not imply any underlying disease state.

Sequelae of a viral upper respiratory tract infection (URI) (Choice D) is incorrect. Some viruses such as parvovirus can cause arthralgias of the small joints of the hands, but they do not cause monoarticular inflammatory arthritis. This patient's recent URI was likely coincidental. Children often experience transient tenosynovitis following URIs, often in the hip.

Uremia (Choice E) describes a pattern of symptoms that develops in patients with renal failure. Symptoms may include encephalopathy, pericarditis, and pruritus; uremia does not cause monoarthritis.

Educational Objective: Septic arthritis should be suspected in patients with risk factors who present with monoarticular arthritis, severe pain with passive flexion, and fever. Arthrocentesis is mandatory and frequently discloses leukocyte counts exceeding 50,000 cells/mm^3. Treatment is with intravenous antibiotics against *S. aureus* and surgical drainage.

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12. A 62-year-old man comes to the physician because he has noticed bloody urine intermittently during the past 2 months. He occasionally passes large clots through his urethra. During the past 2 weeks, he has had pain and swelling over his distal radial forearm. Examination shows tenderness, erythema, and edema over the radius 10 cm proximal to the wrist joint. An x-ray of the left upper extremity shows a lytic lesion of the radius with a pathologic fracture. Which of the following is the most likely diagnosis?

A) Giant cell tumor
B) Leukemia of bone
C) Malignant fibrous histiocytoma
D) Metastatic disease
E) Multiple myeloma
F) Osteosarcoma

Correct Answer: D.

Renal cell carcinoma (RCC) is an adenocarcinoma of tubular epithelial cells. RCC is the most common primary malignancy of the kidney and most commonly occurs in older, male smokers. It can present with gross or microscopic hematuria, flank pain, weight loss, or fever. Laboratory analysis may show polycythemia or hypercalcemia as a result of associated paraneoplastic syndrome production of erythropoietin or parathyroid hormone-related peptide. Hypercalcemia can also result from bony metastasis. Diagnosis of RCC typically occurs with contrast-enhanced CT or MRI and is confirmed by biopsy at the time of nephrectomy. It spreads hematogenously and commonly presents as a metastatic neoplasm. Frequent sites of metastatic disease include the lung, brain, and bone.

Incorrect Answers: A, B, C, E, and F.

Giant cell tumors (Choice A) of bone are composed of mononuclear stromal cells and multinucleated giant cells. They are generally nonmalignant but are aggressive and may invade local structures. They often arise in the distal femur.

Leukemia (Choice B) is a hematologic malignancy that typically affects the bone marrow. Both acute lymphocytic leukemia and acute myelocytic leukemia are hematologic

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older, male smokers. It can present with gross or microscopic hematuria, flank pain, weight loss, or fever. Laboratory analysis may show polycythemia or hypercalcemia as a result of associated paraneoplastic syndrome production of erythropoietin or parathyroid hormone-related peptide. Hypercalcemia can also result from bony metastasis. Diagnosis of RCC typically occurs with contrast-enhanced CT or MRI and is confirmed by biopsy at the time of nephrectomy. It spreads hematogenously and commonly presents as a metastatic neoplasm. Frequent sites of metastatic disease include the lung, brain, and bone.

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Giant cell tumors (Choice A) of bone are composed of mononuclear stromal cells and multinucleated giant cells. They are generally nonmalignant but are aggressive and may invade local structures. They often arise in the distal femur.

Leukemia (Choice B) is a hematologic malignancy that typically affects the bone marrow. Both acute lymphocytic leukemia and acute myelocytic leukemia are hematologic malignancies. Because they are caused by the relative burden of leukemic cells, the clinical presentations of both are similar, including malaise, persistent fever, bleeding or bruising, bone pain, hepatosplenomegaly, and lymphadenopathy.

Malignant fibrous histiocytoma (Choice C), also known as pleomorphic undifferentiated sarcoma, is a sarcoma found in soft tissue such as muscles and tendons, and it only rarely begins in the bone.

Multiple myeloma (Choice E) is a malignancy caused by the neoplastic proliferation of a single plasma cell clone, which overproduces monoclonal immunoglobulin and light or heavy chains. Signs and symptoms of multiple myeloma can include bone pain, anemia, hypercalcemia, renal dysfunction, and lytic bone lesions. However, multiple myeloma would not cause hematuria.

Osteosarcoma (Choice F) is an aggressive, malignant bone tumor that occurs mostly in adolescents. It is the most common primary malignancy of bone and arises from mesenchymal cells with osteoblast-like qualities. The tumor cells produce osteoid, the collagen matrix necessary for mineralization and bone formation. Clinical findings include pain, swelling, and erythema, with x-rays demonstrating periosteal elevation adjacent to the lesion. In this older patient with hematuria, a metastatic bone lesion secondary to RCC is more likely.

Educational Objective: RCC is a common primary malignancy of the kidney that can present with hematuria. Common sites of metastatic disease include the lung, brain, and bone. Bone metastases can present with pain, lytic lesions, and pathologic fractures.

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13. A 72-year-old woman comes to the physician because of a 6-month history of left knee pain. The pain increases when she walks up or down stairs. She rates her pain as a 3 on a 10-point scale. She has not had fever or morning stiffness. She has no history of serious illness and takes no medications. She is 160 cm (5 ft 3 in) tall and weighs 89 kg (196 lb); BMI is 35 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 68/min, respirations are 12/min, and blood pressure is 128/70 mm Hg. Examination of the left knee shows crepitus on passive flexion and extension; there is no synovitis. An x-ray of the left knee is shown. Which of the following is the most appropriate initial pharmacotherapy?

A) Acetaminophen
B) Hydroxychloroquine
C) Ketorolac
D) Oxycodone
E) Prednisone

Correct Answer: A.

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Correct Answer: A.

Acetaminophen is the most appropriate initial pharmacotherapy for this patient with signs and symptoms of osteoarthritis (OA). OA is a noninflammatory arthropathy that occurs secondary to deterioration of articular cartilage. It typically occurs in older persons and may affect any joint, but the hips and knees are commonly affected because of chronic weight-bearing, especially in obese patients. It is not associated with infectious or inflammatory symptoms and is generally insidious in onset. Patients typically complain of chronic pain in a joint that is worse with movement or exertion and is improved with rest, often with limited range of motion because of underlying joint space narrowing and pain. Imaging may demonstrate joint space narrowing, as seen in the x-ray of the knee, and might show osteophytosis and subchondral cystic or sclerotic changes. First-line treatment is with acetaminophen, although only a minority of patients will achieve meaningful relief with this therapy alone. Additional options include nonsteroidal anti-inflammatory drugs (NSAIDs) if patients do not have contraindications, intra-articular injections (eg, cortisone), and joint replacement surgery for severe or refractory cases.

Incorrect Answers: B, C, D, and E.

Hydroxychloroquine (Choice B) is sometimes given as a part of triple therapy for patients with rheumatoid arthritis that does not respond to methotrexate alone. This patient does not have any evidence of rheumatoid arthritis and this medication choice would be inappropriate.

Ketorolac (Choice C) is typically used for the treatment of acute musculoskeletal pain and is given intravenously and by intramuscular injection; therefore, it is not a viable long-term treatment for this patient in the ambulatory setting. Additionally, long-term use of NSAIDs risks the development of gastritis and peptic ulcer disease along with diminished kidnev function.

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Oxycodone (Choice D) is an opiate medication and should be avoided in patients with OA as it provides only moderate benefit and has great potential for harm.

Prednisone (Choice E) is sometimes given for patients with acute gout attacks when they cannot tolerate other medications. While prednisone might make this patient's knee feel better, it is not a viable long-term treatment given the unfavorable adverse effect profile.

Educational Objective: OA is a noninflammatory arthropathy that occurs secondary to deterioration of articular cartilage. It is common in older individuals and commonly affects the knees, hips, and distal joints of the hands. First-line treatment for knee OA is acetaminophen, although some patients may eventually require corticosteroid injections or joint replacement surgery.

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14. A 28-year-old primigravid woman at 7 weeks' gestation is admitted to the hospital because of a 2-day history of shortness of breath, palpitations, and lightheadedness. Pregnancy had been uncomplicated. She has no history of serious illness, and her only medication is a prenatal vitamin. Two months ago, she visited her parents' farm in Wisconsin. The patient's temperature is 37.8°C (100°F), pulse is 38/min, respirations are 20/min, and blood pressure is 110/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 96%. Forehead movement is decreased. There is left facial droop, and the patient is unable to close her left eye. An ECG is shown. Which of the following is the most appropriate next step in management?

A) Administration of ceftriaxone
B) Administration of doxycycline
C) Administration of mifepristone
D) Administration of prednisone
E) Placement of a pacemaker

Correct Answer: A.

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A) Administration of ceftriaxone
B) Administration of doxycycline
C) Administration of mifepristone
D) Administration of prednisone
E) Placement of a pacemaker

Correct Answer: A.

The patient's neurologic symptoms, second-degree atrioventricular (AV) block, and exposure history are concerning for advanced Lyme disease. Lyme disease is a tick-borne disease caused by *Borrelia burgdorferi* endemic in the Northeastern United States. In its early stages, it causes erythema chronicum migrans, which is an expanding rash that may have a central ring-like clearing. It can also be associated with a flu-like illness. In the early stages of Lyme disease, it can be treated with doxycycline, which acts by preventing the attachment of aminoacyl-tRNA to ribosomes. Adverse effects of tetracycline antibiotics include gastrointestinal distress, photosensitivity, and, in children, discoloration of teeth and inhibition of bone growth, which makes it contraindicated in pregnancy. Later stages of Lyme disease can be characterized by carditis, AV block, facial nerve palsy (which is often bilateral), migratory arthralgias, and, if left untreated, encephalopathy and chronic arthritis. Later stages of Lyme disease that affect the heart or central nervous system are generally treated with parenteral ceftriaxone.

Incorrect Answers: B, C, D, and E.

Administration of doxycycline (Choice B) is contraindicated in pregnancy because of the risk for maternal hepatotoxicity and adverse effects on fetal teeth and bone development. Alternative β-lactam antibiotics should be used instead.

Administration of mifepristone (Choice C) is not indicated at this time. Mifepristone is a progesterone antagonist used for medical abortion.

Administration of prednisone (Choice D) has not been shown to be beneficial for patients with facial nerve palsy or other manifestations of late-stage Lyme disease.

Placement of a pacemaker (Choice E) is not currently indicated; however, the patient's symptomatic bradycardia is concerning and does warrant monitoring in an inpatient

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E) Placement of a pacemaker

Correct Answer: A.

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Administration of prednisone (Choice D) has not been shown to be beneficial for patients with facial nerve palsy or other manifestations of late-stage Lyme disease.

Placement of a pacemaker (Choice E) is not currently indicated; however, the patient's symptomatic bradycardia is concerning and does warrant monitoring in an inpatient setting. Some patients with severe AV block do require temporary pacing, though rhythm disturbances caused by Lyme disease do not typically last more than a few days and permanent pacemaker placement is not generally needed.

Educational Objective: Lyme disease is a tick-borne disease caused by *Borrelia burgdorferi* and characteristically causes erythema chronicum migrans, an expanding rash that may have a central ring-like clearing. Early Lyme disease is treated with doxycycline, which prevents the attachment of aminoacyl-tRNA to ribosomes. Doxycycline can cause gastrointestinal distress, photosensitivity, and, in children, discoloration of teeth and inhibition of bone growth, which makes it contraindicated in pregnancy. Later stages of Lyme disease that affect the heart or central nervous system are generally treated with parenteral ceftriaxone.

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15. A previously healthy 53-year-old woman is brought to the emergency department 2 hours after the onset of severe pressure and pain in her chest radiating down her left arm. She says she fell off her bicycle last week and bruised the left side of her rib cage. She has been taking naproxen for pain since then. She takes no other medications. On arrival, she is in severe distress. Her pulse is 110/min, respirations are 25/min, and blood pressure is 80/50 mm Hg. Pulse oximetry on 2 L/min of oxygen by nasal cannula shows an oxygen saturation of 85%. Examination shows cool, mottled skin. Jugular venous pulsations are present 8 cm above the sternal angle. Examination of the chest shows healing ecchymoses and mild tenderness over the ribs on the left. Crackles are heard at both lung bases. S_1 and S_2 are normal; an S_3 is heard. An ECG shows ST-segment depression and a left bundle branch block. Which of the following is the most likely diagnosis?

A) Acute pericarditis
B) Cardiac tamponade
C) Myocardial infarction
D) Pneumothorax
E) Pulmonary embolism

Correct Answer: C.

This patient's presentation with radiating chest pain, signs of congestive heart failure and hypotension, and ST-segment changes with a new left bundle branch block is concerning for acute myocardial infarction (MI). Classic symptoms associated with acute MI include acute-onset chest pain, often radiating to the neck, jaw, or arm, along with shortness of breath, nausea, and/or light-headedness. Risk factors include a history of smoking, diabetes, hypertension, hyperlipidemia, and/or obesity. Use of nonsteroidal anti-inflammatory drugs (NSAIDs), even for short durations, is associated with an increased risk for acute myocardial infarction. The mechanism of adverse cardiovascular effects is likely related to cyclooxygenase-2 inhibition and disruption of the normal balance of prostaglandins and other arachidonic acid derivatives in response to endothelial injury. Significant left ventricular dysfunction may result in cardiogenic pulmonary edema with shortness of breath, tachypnea, hypoxemia, audible rales, and S_3 or S_4 gallop. Treatment requires the use of antiplatelet agents (eg, aspirin, clopidogrel) plus anticoagulants (eg, heparin), pain control, and revascularization through angioplasty, thrombolysis, or coronary artery bypass grafting. For patients who cannot receive percutaneous coronary intervention in a timely manner, thrombolytics are indicated. Thrombolytics such as tissue plasminogen activator function by catalyzing the formation of plasmin from plasminogen. Plasmin is a serine protease that cleaves fibrin clots.

Incorrect Answers: A, B, D, and E

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Incorrect Answers: A, B, D, and E.

Acute pericarditis (Choice A) classically presents with substernal chest pain, which is often pleuritic, worse when lying down, and improves with leaning forward. It can occur secondary to inflammatory, infectious, or malignant conditions. The ECG may show widespread ST-segment changes in noncontiguous leads.

Cardiac tamponade (Choice B) results from an abnormal amount of fluid and pressure in the pericardial sac with equalization of pressure throughout the four heart chambers. Physical examination findings include Beck triad (hypotension, distended jugular veins, and distant heart sounds). Trauma to the ribcage can result in hemopericardium and subsequent tamponade; however, the patient's normal heart sounds and ECG changes are more suggestive of acute MI as the cause of her symptoms.

Tension pneumothorax (Choice D) is characterized by respiratory distress, tracheal deviation, hypotension, decreased breath sounds, and hyperresonance to percussion on physical examination.

Pulmonary embolism (Choice E) typically presents with acute chest pain, shortness of breath, and hypoxemia, often in a patient with deep venous thrombosis or a known hypercoagulable state. The ECG most often shows normal sinus rhythm or sinus tachycardia. Evidence of right heart strain is less common but can include right-axis deviation, S wave in lead I, Q wave in lead III, and inverted T wave in lead III ('S1Q3T3'). ST-segment depressions would not be expected.

Educational Objective: Cardiogenic shock can occur in the setting of acute MI, severe valvular dysfunction, severe heart failure, AV block, or arrhythmia. Signs and symptoms include hypotension, cool and pale extremities, jugular venous distention, and pulmonary edema. Use of NSAIDs increases the risk for acute coronary syndrome and MI.

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16. A 23-year-old man comes to the physician for an examination prior to employment. He feels well. He has no history of serious illness and takes no medications. He is in his first year of law school and sleeps 4 to 5 hours nightly; he reports feeling stressed frequently because of the demanding course load. He has smoked one pack of cigarettes daily for 2 years and drinks one beer daily. He exercises by running for 30 minutes three times weekly. He is 178 cm (5 ft 10 in) tall and weighs 91 kg (200 lb); BMI is 29 kg/m^2. His pulse is 80/min, and blood pressure is 132/96 mm Hg. Serum electrolyte concentrations are within the reference ranges. Urinalysis shows no abnormalities. In addition to advising smoking cessation, which of the following is the most appropriate recommendation to manage this patient's increased blood pressure?

A) Decreased alcohol consumption
B) Increased amount of sleep
C) Weight loss
D) Biofeedback
E) Hydrochlorothiazide therapy

Correct Answer: C.

Weight loss is the intervention that will most likely have a positive effect on lowering this patient's blood pressure. His blood pressure reading of 132/96 mm Hg is in the hypertensive range, and while this reading should be confirmed at a second appointment, interventions to decrease blood pressure should be implemented in the interim. On average, in patients who are overweight or obese, the loss of one pound of body weight correlates with a drop in blood pressure by around 1 mm Hg. Continued aerobic exercise at least several times per week will also help to decrease this patient's blood pressure. Other interventions that are frequently helpful include dietary salt restriction, although many patients with essential hypertension will eventually require pharmacologic therapy to decrease their blood pressure below the current goal of 130/80 mm Hg. Particularly in young patients or those with ongoing hypertension despite the use of three medications including a diuretic, screening for causes of secondary hypertension should be considered.

Incorrect Answers: A, B, D, and E.

Decreased alcohol consumption (Choice A) is unlikely to have a meaningful effect on blood pressure, although male patients with hypertension who drink three or more

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D) Biofeedback

E) Hydrochlorothiazide therapy

Correct Answer: C.

Weight loss is the intervention that will most likely have a positive effect on lowering this patient's blood pressure. His blood pressure reading of 132/96 mm Hg is in the hypertensive range, and while this reading should be confirmed at a second appointment, interventions to decrease blood pressure should be implemented in the interim. On average, in patients who are overweight or obese, the loss of one pound of body weight correlates with a drop in blood pressure by around 1 mm Hg. Continued aerobic exercise at least several times per week will also help to decrease this patient's blood pressure. Other interventions that are frequently helpful include dietary salt restriction, although many patients with essential hypertension will eventually require pharmacologic therapy to decrease their blood pressure below the current goal of 130/80 mm Hg. Particularly in young patients or those with ongoing hypertension despite the use of three medications including a diuretic, screening for causes of secondary hypertension should be considered.

Incorrect Answers: A, B, D, and E.

Decreased alcohol consumption (Choice A) is unlikely to have a meaningful effect on blood pressure, although male patients with hypertension who drink three or more drinks per day should be advised to decrease their intake to two or fewer drinks per day.

Increased amount of sleep (Choice B) may be beneficial for managing this patient's stress but is unlikely to have any effect on his blood pressure.

Biofeedback (Choice D) is a mind-body technique that utilizes visual and/or auditory feedback in an attempt to gain control over involuntarily bodily functions. It is not a proven means of decreasing blood pressure.

Hydrochlorothiazide therapy (Choice E) is an appropriate first-line medication for patients with a diagnosis of essential hypertension, which requires two separate blood pressure readings taken at different times. This patient has a single blood pressure reading in the hypertensive range and does not meet criteria for the diagnosis yet. Additionally, lifestyle interventions such as weight loss are usually attempted first.

Educational Objective: Weight loss is an effective intervention for obese or overweight patients with essential hypertension. For every pound of weight loss, patients can expect to see a decrease in their blood pressure of approximately 1 mm Hg.

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17. Five days after admission to the hospital because of inoperable descending thoracic aortic aneurysm with dissection, a 73-year-old man has moderate back pain. He has been treated with acetaminophen-oxycodone and rest. He has hypertension, type 2 diabetes mellitus, and hypercholesterolemia. On admission, his medications were clopidogrel, levalbuterol, pravastatin, glipizide, metoprolol, lisinopril, and aspirin. The clopidogrel and aspirin were discontinued on hospital day 1. Five years ago, drug-eluting stents were placed in the left main coronary artery and circumflex artery for an anterior myocardial infarction. His current medications are nitroprusside, metoprolol, furosemide, acetaminophen-oxycodone, and levalbuterol. He has smoked one pack of cigarettes daily for 50 years. His temperature is 38.3°C (101°F), pulse is 110/min, and blood pressure is 180/106 mm Hg. Examination shows livedo reticularis over the dorsum of the left lower leg. There are petechiae over the dorsa of the feet and several small, purplish black lesions over the left first, second, and third toes and the right second and third toes. The toes are tender to palpation. There is lower abdominal tenderness; bowel sounds are increased. Laboratory studies show:

Leukocyte count	14,000/mm^3
Segmented neutrophils	80%
Eosinophils	13%
Lymphocytes	5%
Monocytes	2%
Erythrocyte sedimentation rate	130 mm/h
Serum creatinine	2.4 mg/dL
Urine	
Protein	2+
RBC	20–30/hpf
Casts	multiple RBC and granular

Maltese crosses are noted. Which of the following is the most likely diagnosis?

A) Antiphospholipid antibody syndrome
B) Bacterial endocarditis
C) Leukocytoclastic vasculitis

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Protein	2+
RBC	20–30/hpf
Casts	multiple RBC and granular

Maltese crosses are noted. Which of the following is the most likely diagnosis?

A) Antiphospholipid antibody syndrome
B) Bacterial endocarditis
C) Leukocytoclastic vasculitis
D) Multiple cholesterol emboli syndrome
E) Systemic necrotizing vasculitis

Correct Answer: D.

Multiple cholesterol emboli syndrome is the most likely diagnosis in this patient with an aortic aneurysm, livedo reticularis, petechiae, and renal dysfunction. Cholesterol embolization syndrome occurs secondary to the embolization of atherosclerotic plaque contents (eg, cholesterol crystals) from a proximal large artery (eg, aorta) to distal small arteries and arterioles. This results in occlusion of the distal arterial vasculature with cholesterol emboli, which induces a localized inflammatory response and end-organ damage. Dermatologic manifestations of this phenomenon are localized petechiae, livedo reticularis, and blue toe syndrome. Histology of skin lesions discloses biconvex needle-shaped clefts within the arterial lumen left by dissolved cholesterol crystals. Laboratory findings include increased creatinine and leukocytosis with eosinophilia. Risk factors for cholesterol embolization syndrome include trauma, interventional procedures that increase the risk for damage and dislodgement of atherosclerotic plaques such as cardiac catheterization, and aortic dissection. Cholesterol emboli can also involve other organs, potentially resulting in renal failure, colonic ischemia, cerebrovascular accidents, and skeletal muscle ischemia. Onset is usually acute, and treatment is supportive.

Incorrect Answers: A, B, C, and E.

Antiphospholipid antibody syndrome (Choice A) is an autoimmune disorder that can be primary or secondary to an additional autoimmune disorder (eg, systemic lupus erythematosus) and often presents in women with recurrent miscarriages and/or arterial or venous thromboembolic disease.

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Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Antiphospholipid antibody syndrome (Choice A) is an autoimmune disorder that can be primary or secondary to an additional autoimmune disorder (eg, systemic lupus erythematosus) and often presents in women with recurrent miscarriages and/or arterial or venous thromboembolic disease.

Bacterial endocarditis (Choice B) presents with fever, positive blood cultures, and evidence of septic emboli including Osler nodes, Janeway lesions, renal dysfunction, and septic pulmonary emboli. This patient's findings are more likely secondary to cholesterol embolization, not septic emboli.

Leukocytoclastic vasculitis (Choice C) is a pathologic diagnosis and is a nonspecific finding. It is a form of cutaneous vasculitis that can be caused by an underlying rheumatologic disorder, medications, or malignancy. It frequently presents with petechiae and palpable purpura but does not, by definition, affect other organs.

Systemic necrotizing vasculitis (Choice E) is characteristic of polyarteritis nodosa, a systemic vasculitis of small- to medium-sized arteries. Patients frequently present with systemic symptoms and may also have renal involvement as well as livedo reticularis. This patient's known aortic dissection provides a far more likely cause of his clinical symptoms than a systemic vasculitis. Additionally, symptoms of vasculitis tend to be indolent to subacute.

Educational Objective: Aortic dissection increases the risk for atherosclerotic plaque disruption and can lead to cholesterol emboli. Dermatologic manifestations include localized petechiae, livedo reticularis, and blue toe syndrome. Treatment is supportive.

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18. A 13-year-old boy is brought to the emergency department by his father because of a 1-day history of severe, left-sided throat pain. The pain is constant and increases when he swallows or opens his mouth. He also has had mild shortness of breath during this time. He had an episode of tonsillitis 5 years ago that resolved with amoxicillin therapy. He has no other history of serious illness and takes no medications. His temperature is 38.4°C (101.1°F), pulse is 100/min, respirations are 18/min, and blood pressure is 110/65 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 96%. Examination shows edema of the left tonsil and deviation of the uvula with almost complete occlusion of the pharyngeal space. The tonsil is erythematous and fluctuant; there is a diffuse yellow exudate. Which of the following is the most appropriate next step in management?

A) Administration of amoxicillin-clavulanate
B) Administration of hydrocortisone
C) CT scan of the neck with contrast
D) Needle aspiration of the peritonsillar space
E) Tonsillectomy

Correct Answer: D.

Peritonsillar abscess describes the localized accumulation of pus between the palatine tonsil and the pharyngeal muscles and is a potential life-threatening condition because of the risk for local swelling and compression of the airway. It is most common in adolescents, particularly those with a history of prior tonsillitis or pharyngitis. While the infection is often polymicrobial, gram-positive organisms such as *Streptococcus* or *Staphylococcus* species are often predominant. Patients present with fever, severe neck pain, trismus, and localized swelling and fluctuance overlying the tonsil, and they may demonstrate signs of airway compromise such as a muffled voice or drooling. The diagnosis is clinical but may be supported by x-rays. The mainstay of treatment is immediate needle aspiration of the peritonsillar space and antibiotic therapy to provide coverage of gram-positive and anaerobic pathogens.

Incorrect Answers: A, B, C, and E.

Administration of amoxicillin-clavulanate (Choice A) is appropriate oral therapy for patients who have already begun intravenous antibiotic therapy. Commonly employed intravenous agents include amoxicillin-sulbactam, clindamycin, and vancomycin. Antibiotics in this case, regardless of route, would not take the place of needle aspiration

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E) Tonsillectomy

Correct Answer: D.

Peritonsillar abscess describes the localized accumulation of pus between the palatine tonsil and the pharyngeal muscles and is a potential life-threatening condition because of the risk for local swelling and compression of the airway. It is most common in adolescents, particularly those with a history of prior tonsillitis or pharyngitis. While the infection is often polymicrobial, gram-positive organisms such as *Streptococcus* or *Staphylococcus* species are often predominant. Patients present with fever, severe neck pain, trismus, and localized swelling and fluctuance overlying the tonsil, and they may demonstrate signs of airway compromise such as a muffled voice or drooling. The diagnosis is clinical but may be supported by x-rays. The mainstay of treatment is immediate needle aspiration of the peritonsillar space and antibiotic therapy to provide coverage of gram-positive and anaerobic pathogens.

Incorrect Answers: A, B, C, and E.

Administration of amoxicillin-clavulanate (Choice A) is appropriate oral therapy for patients who have already begun intravenous antibiotic therapy. Commonly employed intravenous agents include amoxicillin-sulbactam, clindamycin, and vancomycin. Antibiotics in this case, regardless of route, would not take the place of needle aspiration as the best next step given impending airway compromise.

Administration of hydrocortisone (Choice B), a corticosteroid, would not take priority over performance of needle aspiration. There is conflicting evidence regarding the benefits of administering steroids in the setting of peritonsillar abscess, though it is often employed to decrease oropharyngeal and laryngeal swelling and inflammation.

CT scan of the neck with contrast (Choice C) is not necessary for the diagnosis of peritonsillar abscess but may provide supportive evidence and assist in localization of the infection to the peritonsillar space. Needle aspiration is a more essential initial step.

Tonsillectomy (Choice E) is not necessary for most patients with peritonsillar abscess but may be required for recurrent infections or infections leading to airway compromise. Needle aspiration is sufficient for the majority of cases.

Educational Objective: Peritonsillar abscess describes the localized accumulation of pus between the palatine tonsil and the pharyngeal muscles. Patients present with fever, severe neck pain, trismus, localized swelling and fluctuance overlying the tonsil, muffled voice, and drooling. The mainstay of treatment is immediate needle aspiration of the peritonsillar space to prevent airway compromise as well as antibiotic therapy to provide empiric coverage of pathogens.

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19. A 47-year-old woman comes to the physician because of a 3-month history of a nonproductive cough that is worse on weekdays when she is at work and improves during the weekend. She reports that the cough resolves completely by the end of the weekend. She has not had fever or weight loss. She does not smoke or use illicit drugs. Four months ago, she began working at a dry cleaning business. She is in no distress. Vital signs are within normal limits. An occasional end-expiratory wheeze is heard at both lung bases with mild hyperresonance to percussion. The remainder of the examination shows no abnormalities. Pulmonary function tests are most likely to show which of the following findings?

	FEV_1:FVC Ratio	Peak Expiratory Flow Rate
A)	Decreased	decreased
B)	Decreased	increased
C)	Decreased	normal
D)	Increased	decreased
E)	Increased	increased
F)	Increased	normal
G)	Normal	decreased
H)	Normal	increased
I)	Normal	normal

Correct Answer: A.

Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. This patient is likely suffering from asthma triggered by an allergen she is exposed to at her new place of employment, given that her symptoms resolve completely by the end of the weekend. Acute episodes typically present with episodes of wheezing, dry cough, and dyspnea. Physical examination often shows tachycardia, tachypnea, diffuse wheezes (rhonchi), and prolonged expiration relative to inspiration. Air trapping may occur during acute episodes, which decreases lung density (leading to diminished tactile fremitus, hyperresonance to

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F)	Increased	normal
G)	Normal	decreased
H)	Normal	increased
I)	Normal	normal

Correct Answer: A.

Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. This patient is likely suffering from asthma triggered by an allergen she is exposed to at her new place of employment, given that her symptoms resolve completely by the end of the weekend. Acute episodes typically present with episodes of wheezing, dry cough, and dyspnea. Physical examination often shows tachycardia, tachypnea, diffuse wheezes (rhonchi), and prolonged expiration relative to inspiration. Air trapping may occur during acute episodes, which decreases lung density (leading to diminished tactile fremitus, hyperresonance to percussion, and hyperinflation on chest imaging). Pulmonary function tests may be normal between symptomatic exacerbations, but during such episodes, they typically demonstrate an obstructive pattern with a decreased FEV_1:FVC ratio as well as increased residual volume and total lung capacity. A decreased peak expiratory flow rate caused by obstructed airways is expected.

Incorrect Answers: B, C, D, E, F, G, H, and I.

Choices B and C are incorrect since the peak expiratory flow rate is expected to decrease during an acute asthma exacerbation and the percent reduction from baseline correlates well with episode severity.

Choices D, E, and F are incorrect since the FEV_1:FVC ratio is decreased in obstructive lung disease as would be expected during an acute asthma exacerbation. An increased ratio is suggestive of restrictive lung disease caused by decreased compliance of fibrotic lung tissue resulting in greater initial expiratory force.

Choices G, H, and I are incorrect in the setting of acute symptoms. Choice I, with normal spirometry and peak expiratory flow rate, is expected in between symptomatic episodes when inflammation related to the asthma trigger has subsided and airway obstruction is relieved. The presence of end-expiratory wheezes, hyperresonance to percussion suggestive of air trapping, and ongoing symptoms with a continued exposure indicate that pulmonary function is likely abnormal at this time.

Educational Objective: Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. During acute episodes, pulmonary function tests typically demonstrate an obstructive pattern with a decreased FEV1:FVC and a decreased peak expiratory flow rate.

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G)	Normal	decreased
H)	Normal	increased
I)	Normal	normal

Correct Answer: A.

Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. This patient is likely suffering from asthma triggered by an allergen she is exposed to at her new place of employment, given that her symptoms resolve completely by the end of the weekend. Acute episodes typically present with episodes of wheezing, dry cough, and dyspnea. Physical examination often shows tachycardia, tachypnea, diffuse wheezes (rhonchi), and prolonged expiration relative to inspiration. Air trapping may occur during acute episodes, which decreases lung density (leading to diminished tactile fremitus, hyperresonance to percussion, and hyperinflation on chest imaging). Pulmonary function tests may be normal between symptomatic exacerbations, but during such episodes, they typically demonstrate an obstructive pattern with a decreased FEV_1:FVC ratio as well as increased residual volume and total lung capacity. A decreased peak expiratory flow rate caused by obstructed airways is expected.

Incorrect Answers: B, C, D, E, F, G, H, and I.

Choices B and C are incorrect since the peak expiratory flow rate is expected to decrease during an acute asthma exacerbation and the percent reduction from baseline correlates well with episode severity.

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Educational Objective: Asthma is characterized by reversible obstruction of the bronchi secondary to hyperreactivity and airway inflammation. During acute episodes, pulmonary function tests typically demonstrate an obstructive pattern with a decreased FEV_1:FVC and a decreased peak expiratory flow rate.

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20. A 62-year-old man comes to the physician because of a 1-year history of increasing shortness of breath on exertion. He now has difficulty finishing yard work and climbing stairs in his home. He has not had cough, fever, or night sweats. He has hypertension treated with atenolol. He smoked two packs of cigarettes daily for 30 years but quit 12 years ago. He worked in the auto parts department of a local car dealership until he had to retire last month because of his respiratory symptoms. His temperature is 36.2°C (97.2°F), pulse is 88/min, respirations are 20/min, and blood pressure is 140/82 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90% at rest and 82% after walking 20 feet. Fine inspiratory crackles are heard at both lung bases. The remainder of the examination shows no abnormalities. A high-resolution CT scan of the chest shows a honeycomb appearance of the lungs. Which of the following is the most likely diagnosis?

A) Asbestosis
B) Bronchiolitis obliterans
C) Idiopathic pulmonary fibrosis
D) Mesothelioma
E) Pulmonary embolism
F) Pulmonary Langerhans cell histiocytosis

Correct Answer: C.

Interstitial lung disease (ILD) refers to the heterogeneous group of disorders that result in pulmonary fibrosis and progressively impaired lung function. Common risk factors include occupational and environmental exposures, drug-induced pulmonary toxicity, radiation-induced lung injury, connective tissue disorders, hypersensitivity pneumonitis, and idiopathic disease. Patients classically present with progressive dyspnea and chronic nonproductive cough. Inspiratory crackles and hypertrophic osteoarthropathy may be present on physical examination. Usual interstitial pneumonitis (also called usual interstitial pneumonia) is the most common histopathologic and radiologic pattern of ILD. It is a pattern associated with idiopathic pulmonary fibrosis. Chest x-ray often discloses peripheral and basilar honeycombing (clustered cystic air spaces). Lung biopsy is not commonly needed, but histology will show interstitial fibrosis in a patchwork pattern, honeycomb changes, and fibroblast foci.

Incorrect Answers: A, B, D, E, and F.

Asbestosis (Choice A) is a chronic progressive pulmonary disorder that can result in interstitial pulmonary fibrosis and is most commonly associated with occupational

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Interstitial lung disease (ILD) refers to the heterogeneous group of disorders that result in pulmonary fibrosis and progressively impaired lung function. Common risk factors include occupational and environmental exposures, drug-induced pulmonary toxicity, radiation-induced lung injury, connective tissue disorders, hypersensitivity pneumonitis, and idiopathic disease. Patients classically present with progressive dyspnea and chronic nonproductive cough. Inspiratory crackles and hypertrophic osteoarthropathy may be present on physical examination. Usual interstitial pneumonitis (also called usual interstitial pneumonia) is the most common histopathologic and radiologic pattern of ILD. It is a pattern associated with idiopathic pulmonary fibrosis. Chest x-ray often discloses peripheral and basilar honeycombing (clustered cystic air spaces). Lung biopsy is not commonly needed, but histology will show interstitial fibrosis in a patchwork pattern, honeycomb changes, and fibroblast foci.

Incorrect Answers: A, B, D, E, and F.

Asbestosis (Choice A) is a chronic progressive pulmonary disorder that can result in interstitial pulmonary fibrosis and is most commonly associated with occupational exposures. Characteristic CT imaging findings include peribronchial fibrosis, reticular opacities, and subpleural thickening.

Bronchiolitis obliterans (Choice B) is characterized by chronic inflammation in the bronchioles and, in some cases, alveoli, which leads to deposition of connective tissue and can show an obstructive lung disease pattern on spirometry. Chest CT typically shows bronchial wall thickening and a mosaic pattern through the parenchyma with patchy areas of hypoattenuation.

Mesothelioma (Choice D) appears as a calcified pleural plaque on chest imaging, often with an associated pleural effusion. Risk factors include pulmonary asbestosis and tobacco use.

Pulmonary embolism (Choice E) would not likely explain the duration of this patient's symptoms nor the chest imaging findings. Chronic thromboembolic disease with small, recurrent emboli to the pulmonary vasculature can result in pulmonary hypertension, which presents with progressive dyspnea and signs of right heart failure.

Pulmonary Langerhans cell histiocytosis (Choice F) is a rare interstitial lung disease caused by disordered dendritic cells. It is associated with tobacco use. The condition is characterized by the presence of multiple cysts and nodules on chest imaging. Honeycombing may occur in advanced stages of the disease.

Educational Objective: ILD refers to the heterogeneous group of disorders that result in pulmonary fibrosis and progressively impaired lung function. Idiopathic pulmonary fibrosis is the most common form of ILD associated with a usual interstitial pneumonitis pattern on histopathologic and radiologic evaluation. Characteristic imaging findings include peripheral reticular opacities and architectural distortion resembling a honeycomb appearance.

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21. A 12-month-old boy is brought to the physician 24 hours after the sudden onset of diarrhea. His parents report that he has had approximately 10 episodes of watery stools with no blood or mucus. He has vomited once. He has been drinking fluids and eating crackers but has not been as active as usual. He appears alert and is not in distress. His temperature is 38.3°C (101°F), pulse is 120/min, respirations are 26/min, and blood pressure is 90/60 mm Hg. Physical examination shows moist mucous membranes. The oropharynx appears normal. The lungs are clear to auscultation. The abdomen is soft and nontender with no distention. Bowel sounds are normal. All extremities are warm and well perfused. Laboratory studies show:

Serum	
Na^+	139 mEq/L
K^+	4.0 mEq/L
Cl^-	110 mEq/L
HCO_3^-	15 mEq/L
Urea nitrogen	10 mg/dL
Creatinine	0.5 mg/dL
Fecal leukocytes	none

Which of the following is the most appropriate next step in management?

A) Oral rehydration
B) Oral bismuth subsalicylate therapy
C) Oral metoclopramide therapy
D) Oral penicillin therapy
E) Intravenous administration of 0.9% saline

Correct Answer: A.

Rotavirus is a double-stranded RNA virus that is a common cause of infectious diarrhea in children. The diarrhea caused by rotavirus is watery, profuse, often foul-smelling, and typically nonbloody. Children with gastroenteritis are at increased risk for volume depletion in comparison with adults. Clinical signs of volume depletion

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Correct Answer: A.

Rotavirus is a double-stranded RNA virus that is a common cause of infectious diarrhea in children. The diarrhea caused by rotavirus is watery, profuse, often foul-smelling, and typically nonbloody. Children with gastroenteritis are at increased risk for volume depletion in comparison with adults. Clinical signs of volume depletion include tachycardia, tachypnea, hypotension, dry mucous membranes, poor skin turgor, and prolonged capillary refill. Children may present with irritability or lethargy. If diarrhea is severe, laboratory evaluation can show perturbations in serum sodium and potassium concentrations. Severe volume depletion secondary to diarrhea is usually accompanied by a significant stool loss of bicarbonate, which, in combination with the hypoperfusion of end organs resulting in lactic acidosis, may result in severe metabolic acidosis. However, in mild cases of diarrhea without significant electrolyte abnormalities, vital sign abnormalities, or signs of shock, and when the patient is able to tolerate nutrition by mouth, oral rehydration is the mainstay of management. Oral rehydration therapy (ORT) is first-line for the treatment of fluid and electrolyte losses caused by mild to moderate gastroenteritis. ORT is advantageous because of its lower cost, ease of administration, noninvasive treatment, and ability to be continued at home by caregivers.

Incorrect Answers: B, C, D, and E.

Bismuth subsalicylate therapy (Choice B) has been shown to decrease symptoms of diarrhea but is only used as an adjunct to oral rehydration therapy, which is first-line in the management of diarrhea.

Metoclopramide (Choice C) is a D_2 receptor antagonist that increases gastric contractility and motility. It is used primarily for the treatment of gastroparesis and as an antiemetic. It has no role in the treatment or management of acute gastroenteritis.

Antibiotics such as penicillin (Choice D) should not be used for well-appearing children with acute gastroenteritis unless a specific pathogen has been isolated, since viruses such as rotavirus are the most common cause of acute diarrhea in children. Management of viral diarrheal illnesses in children involves supportive care.

Intravenous administration of 0.9% saline (Choice E) would be appropriate in children presenting with hypovolemic shock, hypotension, severe electrolyte derangements, or an inability to tolerate rehydration by mouth.

Educational Objective: Oral rehydration therapy is first-line in the management of mild to moderate hypovolemia and/or electrolyte disturbances in the setting of acute gastroenteritis.

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22. A 57-year-old man comes to the physician 3 days after undergoing colonoscopy screening that showed an ulcerated mass of invasive, poorly differentiated adenocarcinoma in the mid ascending colon. He feels well and has not had abdominal discomfort; black, tarry, or bloody stools; or weight loss. He has sciatica treated with ibuprofen as needed. Vital signs are within normal limits. Examination shows no abnormalities. Results of laboratory studies are within the reference ranges. Which of the following is the most appropriate next step in diagnosis?

A) Abdominal ultrasonography
B) CT scan of the abdomen
C) Bone scan
D) PET scan
E) Surgical exploration

Correct Answer: B.

Colorectal cancer most commonly occurs in the rectosigmoid region of the large bowel. Cancers within the descending and rectosigmoid colon are more likely to be infiltrative, resulting in potential obstruction of the large bowel. Lesions within the ascending colon are typically exophytic masses with slow bleeding, resulting in iron deficiency anemia. After colorectal adenocarcinoma is directly visualized and identified on colonoscopy, CT imaging of the abdomen and pelvis is performed to evaluate for the extent of local disease, regional lymphadenopathy, and/or distant metastases, along with any tumor-related complications such as obstruction, perforation, and fistula formation. This will help stage the disease and guide oncologic and surgical treatment planning.

Incorrect Answers: A, C, D, and E.

Abdominal ultrasonography (Choice A) can be used to evaluate the abdominal aorta and its main branches, as well as evaluate the abdominal viscera for acute intra-abdominal pathology. Cross-sectional imaging with CT is more comprehensive for evaluating the extent of lymphadenopathy and metastatic disease for staging.

Radionuclide bone scan (Choice C) uses technetium 99m-methyl diphosphonate (Tc-99m MDP) to evaluate for the presence of osteoblastic osseous metastases and is most commonly used in the setting of breast and prostate cancer.

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B) CT scan of the abdomen
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E) Surgical exploration

Correct Answer: B.

Colorectal cancer most commonly occurs in the rectosigmoid region of the large bowel. Cancers within the descending and rectosigmoid colon are more likely to be infiltrative, resulting in potential obstruction of the large bowel. Lesions within the ascending colon are typically exophytic masses with slow bleeding, resulting in iron deficiency anemia. After colorectal adenocarcinoma is directly visualized and identified on colonoscopy, CT imaging of the abdomen and pelvis is performed to evaluate for the extent of local disease, regional lymphadenopathy, and/or distant metastases, along with any tumor-related complications such as obstruction, perforation, and fistula formation. This will help stage the disease and guide oncologic and surgical treatment planning.

Incorrect Answers: A, C, D, and E.

Abdominal ultrasonography (Choice A) can be used to evaluate the abdominal aorta and its main branches, as well as evaluate the abdominal viscera for acute intra-abdominal pathology. Cross-sectional imaging with CT is more comprehensive for evaluating the extent of lymphadenopathy and metastatic disease for staging.

Radionuclide bone scan (Choice C) uses technetium 99m-methyl diphosphonate (Tc-99m MDP) to evaluate for the presence of osteoblastic osseous metastases and is most commonly used in the setting of breast and prostate cancer.

PET scan (Choice D) can be used to detect and diagnose hypermetabolic disease, most commonly in the setting of cancer. In this patient with diagnosed colon adenocarcinoma, CT scan of the abdomen is sufficient for initial evaluation and the next appropriate step for staging and surgical planning.

Surgical exploration (Choice E) would be inappropriate prior to evaluating the extent of disease and/or any tumor-related complications.

Educational Objective: After colorectal adenocarcinoma is identified on colonoscopy, CT imaging is necessary to evaluate the extent of local disease, regional lymphadenopathy, and/or distant metastases, along with any tumor-related complications such as obstruction, perforation, and fistula formation.

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23. An 84-year-old woman comes to the office because of a 1-week history of increasingly severe pain and swelling of the left side of her face. The pain worsens with eating. She has mild dementia, Alzheimer type, and hypertension. Her medications are donepezil and hydrochlorothiazide. Her temperature is 38.1°C (100.5°F), pulse is 86/min, and blood pressure is 144/90 mm Hg. Examination of the face shows left-sided edema that is tender to palpation. On palpation of the left parotid gland, purulent discharge is expressed from the orifice of the Stensen duct. Several tender nodes are palpated in the left anterior cervical chain. Cardiopulmonary examination shows no abnormalities. Which of the following is the most likely infectious agent?

A) *Clostridium perfringens*
B) *Moraxella catarrhalis*
C) *Pseudomonas aeruginosa*
D) *Staphylococcus aureus*
E) *Streptococcus pneumoniae*

Correct Answer: D.

Suppurative parotitis typically occurs in elderly adults with underlying risk factors, such as debilitation, poor oral hygiene, or dehydration. It presents with the acute onset of fever, preauricular pain, erythema, and swelling, as well as leukocytosis. Purulent discharge may be noted at the Stensen duct, which travels from the anterior aspect of the parotid gland to the parotid papilla in the upper mouth near the second maxillary molar. While infections are frequently polymicrobial, *Staphylococcus aureus* is the most frequently implicated pathogen. The diagnosis is established based on clinical examination, as well as cultures of any expressible drainage. Empiric therapy includes antibiotics with broad-spectrum coverage of both *S. aureus* and anaerobic organisms.

Incorrect Answers: A, B, C, and E.

Clostridium perfringens (Choice A) is a gram-positive anaerobe that may cause skin and soft-tissue infections, include necrotizing fasciitis. It is not commonly implicated in parotitis.

Moraxella catarrhalis (Choice B) is a gram-negative diplococcus that causes otitis media and bronchitis. It is rarely implicated in suppurative parotitis.

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B) *Moraxella catarrhalis*
C) *Pseudomonas aeruginosa*
D) *Staphylococcus aureus*
E) *Streptococcus pneumoniae*

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Clostridium perfringens (Choice A) is a gram-positive anaerobe that may cause skin and soft-tissue infections, include necrotizing fasciitis. It is not commonly implicated in parotitis.

Moraxella catarrhalis (Choice B) is a gram-negative diplococcus that causes otitis media and bronchitis. It is rarely implicated in suppurative parotitis.

Pseudomonas aeruginosa (Choice C) is a gram-negative rod that causes a variety of infections, including pneumonia and bacteremia. It is rarely implicated in suppurative parotitis.

Streptococcus pneumoniae (Choice E) is a gram-positive coccus that causes a wide array of infections, including pneumonia, meningitis, otitis media, and skin and soft-tissue infections. It is rarely implicated in suppurative parotitis.

Educational Objective: Suppurative parotitis typically occurs in elderly adults and presents with fever and preauricular pain, erythema, swelling, and purulent discharge from the parotid gland. *Staphylococcus aureus* is the most frequently implicated pathogen.

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24. An 82-year-old woman, who resides in a skilled nursing care facility, is brought to the emergency department because of a 2-day history of diffuse, severe abdominal pain, which has worsened during the past day. She rates her pain as an 8 on a 10-point scale. Her last bowel movement was 3 days ago. She has severe diffuse arthritis, osteoporosis, hypertension, and scoliosis. Her medications are oxycodone, alendronate, hydrochlorothiazide, and calcium and vitamin D supplementation. Her blood pressure is 148/62 mm Hg. The abdomen is tympanitic to percussion with marked distention and diffuse tenderness; there is no guarding or rigidity. High-pitched bowel sounds are heard. X-rays of the abdomen are most likely to show which of the following findings?

A) Dilation of the sigmoid colon
B) Inflammatory mass and fecalith in the cecum
C) Mucosal edema of the small intestine
D) Normal gas pattern in the large and small intestines
E) Presence of free air under the diaphragm

Correct Answer: A.

Sigmoid volvulus is an uncommon cause of bowel obstruction and presents with acute onset abdominal pain and distention, constipation, and vomiting. Patients are typically elderly and in poor health or otherwise debilitated. If untreated, volvulus may lead to bowel necrosis or to perforation secondary to bowel distention, which in turn may cause sepsis and septic shock. Sigmoid volvulus occurs when the sigmoid colon rotates around its mesentery, leading to intestinal closed-loop luminal obstruction. X-rays typically demonstrate a dilated, air-filled sigmoid colon, while CT scan may demonstrate a whirl of sigmoid colon around its mesenteric attachment. Patients without evidence of sepsis or bowel necrosis may be treated with flexible sigmoidoscopy, which reduces the affected segment of bowel back to normal anatomic position. Patients with evidence of sepsis or bowel necrosis require immediate surgical intervention.

Incorrect Answers: B, C, D, and E.

Inflammatory mass and fecalith in the cecum (Choice B) is characteristic of appendicitis, in which a bacterial infection of the appendix ensues after obstruction by a fecalith. Appendicitis does not typically lead to bowel obstruction, but it may lead to perforation, necrosis, or abscess.

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D) Normal gas pattern in the large and small intestines

E) Presence of free air under the diaphragm

Correct Answer: A.

Sigmoid volvulus is an uncommon cause of bowel obstruction and presents with acute onset abdominal pain and distention, constipation, and vomiting. Patients are typically elderly and in poor health or otherwise debilitated. If untreated, volvulus may lead to bowel necrosis or to perforation secondary to bowel distention, which in turn may cause sepsis and septic shock. Sigmoid volvulus occurs when the sigmoid colon rotates around its mesentery, leading to intestinal closed-loop luminal obstruction. X-rays typically demonstrate a dilated, air-filled sigmoid colon, while CT scan may demonstrate a whirl of sigmoid colon around its mesenteric attachment. Patients without evidence of sepsis or bowel necrosis may be treated with flexible sigmoidoscopy, which reduces the affected segment of bowel back to normal anatomic position. Patients with evidence of sepsis or bowel necrosis require immediate surgical intervention.

Incorrect Answers: B, C, D, and E.

Inflammatory mass and fecalith in the cecum (Choice B) is characteristic of appendicitis, in which a bacterial infection of the appendix ensues after obstruction by a fecalith. Appendicitis does not typically lead to bowel obstruction, but it may lead to perforation, necrosis, or abscess.

Mucosal edema of the small intestine (Choice C) may be observed in mesenteric ischemia. Patients typically present with hematochezia and signs of shock; they do not typically present with bowel obstruction.

Normal gas pattern in the large and small intestines (Choice D) is unlikely. This patient's constipation and distended, tympanitic abdomen with high-pitched bowel sounds is suggestive of intestinal obstruction.

Presence of free air under the diaphragm (Choice E) may be observed in the setting of intestinal perforation. Patients with intestinal perforation typically also present with fever, tachycardia, hypotension, and rebound tenderness to abdominal palpation.

Educational Objective: Sigmoid volvulus, a rotation of the large bowel around its mesentery, presents with acute abdominal pain and distension, constipation, and vomiting, typically in elderly, debilitated patients. It causes a large bowel, luminal obstruction. X-rays typically demonstrate a dilated, air-filled sigmoid colon, while CT scan may demonstrate a whirl of sigmoid colon around its mesenteric attachment.

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25. A 57-year-old woman with diabetic nephropathy comes to the physician for a routine examination. She has chronic kidney disease, type 2 diabetes mellitus, and hypertension. Her medications are glyburide, enalapril, and metoprolol. Her blood pressure is 128/90 mm Hg. Cardiopulmonary examination shows no abnormalities. There is trace pedal edema. A 24-hour urine collection shows a total protein concentration of 5000 mg and creatinine clearance of 40 mL/min. Measurement of which of the following is the most appropriate next step to prevent complications of this patient's kidney disease?

A) Hemoglobin concentration
B) Platelet count
C) Serum C-reactive protein concentration
D) Serum ferritin concentration
E) Serum thyroid-stimulating hormone concentration

Correct Answer: A.

Erythropoietin is a hormone produced by the interstitial cells in the renal peritubular capillary bed. It is upregulated in response to hypoxia and stimulates proliferation of erythrocytic progenitors in the bone marrow. In the setting of chronic renal disease, there is insufficient production of erythropoietin by the kidneys, resulting in diminished bone marrow stimulation and subsequent normocytic, nonhemolytic anemia. For patients with chronic kidney disease, screening with a complete blood count should be performed to evaluate the hemoglobin concentration for anemia. On laboratory evaluation, patients will likely demonstrate a decreased hemoglobin concentration, normal mean corpuscular volume, diminished reticulocyte count, normal ferritin concentration, and normal transferrin saturation. Supplemental administration of erythropoietin to patients with chronic renal insufficiency, especially those with end-stage kidney disease, can prevent and treat the development of normocytic anemia.

Incorrect Answers: B, C, D, and E.

Thrombocytopenia is a common complication in patients with chronic liver disease and cirrhosis, along with various other hematologic disorders. Measuring the platelet count (Choice B) is not necessary for patients with chronic kidney disease. While platelets may be less functional in the setting of uremia, the platelet count is typically unaffected.

Serum C-reactive protein concentration (Choice C) is an acute phase reactant synthesized by the liver that can be increased in inflammatory and infectious conditions. It

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E) Serum thyroid-stimulating hormone concentration

Correct Answer: A.

Erythropoietin is a hormone produced by the interstitial cells in the renal peritubular capillary bed. It is upregulated in response to hypoxia and stimulates proliferation of erythrocytic progenitors in the bone marrow. In the setting of chronic renal disease, there is insufficient production of erythropoietin by the kidneys, resulting in diminished bone marrow stimulation and subsequent normocytic, nonhemolytic anemia. For patients with chronic kidney disease, screening with a complete blood count should be performed to evaluate the hemoglobin concentration for anemia. On laboratory evaluation, patients will likely demonstrate a decreased hemoglobin concentration, normal mean corpuscular volume, diminished reticulocyte count, normal ferritin concentration, and normal transferrin saturation. Supplemental administration of erythropoietin to patients with chronic renal insufficiency, especially those with end-stage kidney disease, can prevent and treat the development of normocytic anemia.

Incorrect Answers: B, C, D, and E.

Thrombocytopenia is a common complication in patients with chronic liver disease and cirrhosis, along with various other hematologic disorders. Measuring the platelet count (Choice B) is not necessary for patients with chronic kidney disease. While platelets may be less functional in the setting of uremia, the platelet count is typically unaffected.

Serum C-reactive protein concentration (Choice C) is an acute phase reactant synthesized by the liver that can be increased in inflammatory and infectious conditions. It can be helpful in evaluating the severity of autoimmune and inflammatory disease flares.

Serum ferritin concentration (Choice D) is used in the evaluation of anemia. Increased serum ferritin can be seen in hemochromatosis, whereas decreased ferritin concentrations can be seen in iron deficiency anemia. The anemia caused by chronic kidney disease typically shows normal ferritin concentrations.

Serum thyroid-stimulating hormone concentration (TSH) (Choice E) is produced in the anterior pituitary and influences the production of thyroid hormone by the thyroid. TSH is increased in the setting of primary hypothyroidism, which most frequently presents with fatigue, weight gain, constipation, cold intolerance, and oligomenorrhea. Physical signs include bradycardia, dry and edematous skin, as well as delayed relaxation of deep tendon reflexes.

Educational Objective: Patients with chronic kidney disease demonstrate a decreased production of erythropoietin by the kidneys, leading to diminished bone marrow stimulation and subsequent normocytic anemia.

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26. A previously healthy 42-year-old woman, gravida 3, para 3, comes to the physician because of a 3-month history of progressive urinary incontinence. She has loss of urine with coughing, sneezing, and exercising. Her last bowel movement was 3 days ago. She has no history of gynecologic illness. She has gastroesophageal reflux disease treated with omeprazole and hypertension treated with hydrochlorothiazide. Her children were born following uncomplicated vaginal deliveries. Her blood pressure is 120/70 mm Hg. Physical examination shows no abnormalities. Pelvic examination shows bulging of the anterior vaginal wall. Her postvoid residual volume is 50 mL. Urinalysis shows no blood, WBCs, or nitrites. There is loss of urine on cough stress test. Which of the following is the most likely cause of this patient's loss of urine?

A) Bladder tumor
B) Constipation
C) Hydrochlorothiazide therapy
D) Overflow incontinence
E) Urethral hypermobility
F) Urinary tract infection

Correct Answer: E.

Stress urinary incontinence is common in multiparous women and in men following prostate surgery as a result of weakness of the muscles and connective tissues of the pelvic floor. In multiparous women, this is typically secondary to pregnancy with resultant mechanical stress on the vaginal wall and pelvic floor. This weakness of the pelvic floor in turn compromises support of the pelvic structures, including the uterus, bladder, urethra, and rectum. A urethrocele occurs when the urethra prolapses into the anterior vaginal wall or out of the urethral opening itself because of the loss of its proximal support. Increased abdominal pressure causes the vesicourethral junction to move out of place, preventing sphincter closure, with the subsequent leakage of urine. Patients typically present with small amounts of urine leakage associated with increases in intra-abdominal pressure (eg, cough, heavy lifting). Stress urinary incontinence is associated with urethral hypermobility. It can occur alone or in conjunction with a cystocele and is a common cause of stress incontinence.

Incorrect Answers: A, B, C, D, and F.

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pelvic floor. In multiparous women, this is typically secondary to pregnancy with resultant mechanical stress on the vaginal wall and pelvic floor. This weakness of the pelvic floor in turn compromises support of the pelvic structures, including the uterus, bladder, urethra, and rectum. A urethrocele occurs when the urethra prolapses into the anterior vaginal wall or out of the urethral opening itself because of the loss of its proximal support. Increased abdominal pressure causes the vesicourethral junction to move out of place, preventing sphincter closure, with the subsequent leakage of urine. Patients typically present with small amounts of urine leakage associated with increases in intra-abdominal pressure (eg, cough, heavy lifting). Stress urinary incontinence is associated with urethral hypermobility. It can occur alone or in conjunction with a cystocele and is a common cause of stress incontinence.

Incorrect Answers: A, B, C, D, and F.

Bladder tumor (Choice A) can lead to obstruction of the bladder outlet and overflow incontinence. The bulge in the patient's anterior vaginal wall is suggestive of urethrocele rather than bladder cancer.

Constipation (Choice B) may lead to urinary incontinence via direct external compression of the bladder by the distended bowel. This patient has no history of constipation, rendering this less likely as a cause of her urinary incontinence.

Hydrochlorothiazide therapy (Choice C) is a possible cause of urinary incontinence through its diuretic action. However, this patient's examination suggests the presence of a urethrocele and is more consistent with stress incontinence caused by urethral hypermobility.

Overflow incontinence (Choice D) can be caused by underactive or flaccid detrusor muscles or bladder outlet obstruction, resulting in urinary retention and an increased postvoid residual bladder volume. When the intravesical hydrostatic pressure eventually overwhelms the internal and external urinary sphincter closing pressures, the patient will demonstrate passive leakage of urine.

Urinary tract infection (Choice F) can present with overactive bladder (frequency, urgency, urge incontinence). Patients generally also experience dysuria and suprapubic pain.

Educational Objective: Stress urinary incontinence is common in multiparous women and in men following prostate surgery as a result of weakness of the muscles and connective tissues of the pelvic floor. Patients typically present with small amounts of urine leakage associated with increases in intra-abdominal pressure. Stress urinary incontinence is associated with urethral hypermobility.

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27. A 32-year-old woman, gravida 2, para 1, at 38 weeks' gestation is admitted to the hospital in labor. Her pregnancy has been complicated by the diagnosis of HIV infection. Antiretroviral therapy with zidovudine (AZT), lamivudine (3TC), and nelfinavir was begun at 12 weeks' gestation. She has tolerated therapy well. Her most recent CD4+ T-lymphocyte count was 600/mm^3 (Normal≥500), and plasma HIV viral load was 480 copies/mL. She wishes to attempt vaginal delivery. Which of the following is contraindicated with this patient's pregnancy?

A) Amnioinfusion
B) Bulb suctioning of the newborn
C) Determination of umbilical artery pH at delivery
D) Fetal scalp electrode placement
E) Intrauterine pressure catheter placement

Correct Answer: D.

The risk of intrapartum vertical transmission of HIV may be decreased by routine maternal HIV testing during pregnancy and by careful planning of delivery. The risk for vertical transmission of HIV in women with viral loads of less than 1000 copies per mL is low in both vaginal and cesarean methods of delivery. However, efforts should be made to decrease the amount and duration of contact between the fetus and maternal blood. Invasive monitoring techniques increase the risk for exposing the fetus to maternal blood and should be avoided. The American College of Obstetricians and Gynecologists (ACOG) recommends against the placement of fetal scalp electrodes when delivering newborns to HIV-positive mothers for this reason, regardless of the maternal viral load. Infants should receive postexposure prophylaxis with antiviral medications.

Incorrect Answers: A, B, C, and E.

Amnioinfusion (Choice A) is the process of instilling fluid into the amniotic cavity. Amnioinfusion may be useful for the management of oligohydramnios, especially when fetal heart rate monitoring shows variable decelerations suggestive of umbilical cord compression. It is not known to directly increase the risk for vertical transmission of HIV.

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D) Fetal scalp electrode placement

E) Intrauterine pressure catheter placement

Correct Answer: D.

The risk of intrapartum vertical transmission of HIV may be decreased by routine maternal HIV testing during pregnancy and by careful planning of delivery. The risk for vertical transmission of HIV in women with viral loads of less than 1000 copies per mL is low in both vaginal and cesarean methods of delivery. However, efforts should be made to decrease the amount and duration of contact between the fetus and maternal blood. Invasive monitoring techniques increase the risk for exposing the fetus to maternal blood and should be avoided. The American College of Obstetricians and Gynecologists (ACOG) recommends against the placement of fetal scalp electrodes when delivering newborns to HIV-positive mothers for this reason, regardless of the maternal viral load. Infants should receive postexposure prophylaxis with antiviral medications.

Incorrect Answers: A, B, C, and E.

Amnioinfusion (Choice A) is the process of instilling fluid into the amniotic cavity. Amnioinfusion may be useful for the management of oligohydramnios, especially when fetal heart rate monitoring shows variable decelerations suggestive of umbilical cord compression. It is not known to directly increase the risk for vertical transmission of HIV.

Bulb suctioning of the newborn (Choice B) is not known to directly increase the risk for vertical transmission of HIV and may be performed if necessary.

Determination of umbilical artery pH at delivery (Choice C) may be performed, since this does not directly prolong the duration of exposure of the newborn to maternal blood or fluids.

Intrauterine pressure catheter placement (IUPC) (Choice E) may be cautiously used if necessary and if clearly indicated. Few data exist on the risk for vertical transmission associated with IUPC usage, and ACOG recommendations do not provide guidance on their usage.

Educational Objective: Invasive monitoring techniques, such as fetal scalp electrode placement, increase the risk for exposing the fetus to maternal blood and should be avoided during the intrapartum management of HIV-positive mothers. ACOG recommends against the placement of fetal scalp electrodes when delivering newborns to HIV-positive mothers.

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28. A 22-year-old primigravid woman at 38 weeks' gestation comes to the physician as a new patient because she recently moved to this area. Pregnancy has been uncomplicated. Her only medication is a prenatal vitamin. Her father has factor VIII deficiency. The patient is concerned that her child may have hemophilia and bleeding complications at the time of delivery. Which of the following is the most appropriate physician recommendation?

A) Measurement of factor VIII concentration in the newborn at least 24 hours after delivery
B) Prophylactic maternal cryoprecipitate transfusion prior to delivery
C) Prophylactic maternal platelet transfusion prior to delivery
D) Scheduled cesarean delivery
E) Testing of cord blood for factor VIII concentration after delivery if the baby is a boy

Correct Answer: E.

Testing of cord blood for factor VIII concentration after delivery if the baby is a boy is the most appropriate screening test to determine if the patient's baby has hemophilia A. Because hemophilia is an X-linked disease, the patient is a carrier of the hemophilia A gene given that her father had the disease. If the patient's child is female, she will have a 50% chance of being a carrier, but she will not have the disease since she will inherit at least one functional allele from her father's X-chromosome. On the other hand, if the child is male, then he will have a 50% chance of having the disease and should be screened by examination of the cord blood for factor VIII concentration at the time of delivery. Deficient or absent concentrations of factor VIII are consistent with hemophilia A.

Incorrect Answers: A, B, C, and D.

Measurement of factor VIII concentration in the newborn at least 24 hours after delivery (Choice A) is incorrect since blood tests must only be performed if the baby is male. Additionally, umbilical cord blood is preferred over serum concentrations of factor VIII.

Prophylactic maternal cryoprecipitate transfusion prior to delivery (Choice B) is unnecessary since the mother does not have hemophilia and does not have an increased risk for bleeding. Similarly, prophylactic maternal platelet transfusion prior to delivery (Choice C) is not required since this patient does not have a history of severe thrombocytopenia, and a platelet transfusion will not provide any benefit even if the baby does have hemophilia.

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A) Measurement of factor VIII concentration in the newborn at least 24 hours after delivery

B) Prophylactic maternal cryoprecipitate transfusion prior to delivery

C) Prophylactic maternal platelet transfusion prior to delivery

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E) Testing of cord blood for factor VIII concentration after delivery if the baby is a boy

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Measurement of factor VIII concentration in the newborn at least 24 hours after delivery (Choice A) is incorrect since blood tests must only be performed if the baby is male. Additionally, umbilical cord blood is preferred over serum concentrations of factor VIII.

Prophylactic maternal cryoprecipitate transfusion prior to delivery (Choice B) is unnecessary since the mother does not have hemophilia and does not have an increased risk for bleeding. Similarly, prophylactic maternal platelet transfusion prior to delivery (Choice C) is not required since this patient does not have a history of severe thrombocytopenia, and a platelet transfusion will not provide any benefit even if the baby does have hemophilia.

Scheduled cesarean delivery (Choice D) is not indicated since vaginal birth does not place the baby at any higher risk for bleeding than a cesarean delivery.

Educational Objective: Male babies born to mothers with a family history of hemophilia A, an X-linked disease, should be screened for the presence of low or absent factor VIII concentrations immediately after birth through direct sampling of the umbilical cord blood.

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29. A 36-year-old woman comes to the clinic for a routine examination. She has hypertension treated with lisinopril. She has no other history of serious illness or operative procedures. She uses a copper IUD for contraception. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Her maternal aunt was diagnosed with ovarian cancer at age 42 years. Her mother died in a motor vehicle collision at age 45 years. The patient's vital signs are within normal limits. On examination, a 2-cm, fixed nontender mass is palpated in the upper outer quadrant of the right breast. Examination of the left breast shows no abnormalities. Findings on fine-needle biopsy of the mass are consistent with ductal carcinoma. Which of the following is the most appropriate next step in management?

A) Bilateral mastectomy
B) Bilateral salpingo-oophorectomy
C) Genetic counseling for *BRCA* mutations
D) Pelvic ultrasonography and serum measurement of CA 125 concentration
E) Removal of the IUD

Correct Answer: C.

The most common type of breast cancer is invasive ductal carcinoma, which typically presents as a palpable, immobile breast mass. Most breast cancers are sporadic, though a minority are caused by germline *BRCA1* or *BRCA2* mutations, which are tumor suppressor genes. Indications for genetic testing for *BRCA* mutations include a personal history of breast cancer diagnosed at younger than age 45 years or a personal or family history of ovarian cancer or male breast cancer. Genetic counselors commonly discuss genetic testing options and implications. Genetic counselors also typically advise patients on the next steps in the case of a positive test (eg, identifying and informing at-risk family members) or a negative test.

Incorrect Answers: A, B, D, and E.

Bilateral mastectomy (Choice A) and bilateral salpingo-oophorectomy (Choice B) may be performed prophylactically in *BRCA* mutation carriers to decrease the risk for breast and/or ovarian cancers. However, this patient should first undergo genetic counseling and potential testing for a *BRCA* mutation.

Pelvic ultrasonography and serum measurement of CA 125 concentration (Choice D) may be used to screen high-risk patients for ovarian cancer or to follow known cases.

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A) Bilateral mastectomy

B) Bilateral salpingo-oophorectomy

C) Genetic counseling for *BRCA* mutations

D) Pelvic ultrasonography and serum measurement of CA 125 concentration

E) Removal of the IUD

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Bilateral mastectomy (Choice A) and bilateral salpingo-oophorectomy (Choice B) may be performed prophylactically in *BRCA* mutation carriers to decrease the risk for breast and/or ovarian cancers. However, this patient should first undergo genetic counseling and potential testing for a *BRCA* mutation.

Pelvic ultrasonography and serum measurement of CA 125 concentration (Choice D) may be used to screen high-risk patients for ovarian cancer or to follow known cases. These screening methods are less helpful in average-risk patients. This patient's risk for ovarian cancer needs to be established first with genetic counseling and potential testing for a *BRCA* mutation.

Removal of the IUD (Choice E) would not be necessary. IUDs have been associated with a lower risk for ovarian and cervical cancers.

Educational Objective: Most breast cancers are sporadic, though a minority are caused by germline *BRCA* mutations. Indications for genetic evaluation for *BRCA* mutations include a personal history of breast cancer diagnosed at younger than age 45 years or a personal or family history of ovarian cancer or male breast cancer.

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30. A 27-year-old woman is evaluated in the hospital 36 hours after undergoing cesarean delivery at term because of a prolonged first stage of labor and rupture of membranes. She currently reports abdominal pain and breast tenderness. Current medications are oxycodone and acetaminophen. Her temperature is 38.9°C (102°F), pulse is 100/min, respirations are 18/min, and blood pressure is 110/60 mm Hg. Examination shows mild breast tenderness and induration. The incision site is clean and not erythematous. The uterus is diffusely tender to mild palpation. A urine sample shows multiple RBCs. Which of the following is the most appropriate next step in management?

A) Observation only
B) Breast binding
C) Incentive spirometry
D) Endometrial culture
E) Antibiotic therapy

Correct Answer: E.

A postpartum patient with fever and severe uterine tenderness raises suspicion for endometritis. Postpartum endometritis is an acute, typically polymicrobial infection of the uterine endometrium involving a mixture of aerobes and anaerobes from the genital tract. During labor and delivery, microbes from the genital tract can enter the uterine cavity and colonize bleeding or damaged uterine tissue, resulting in postpartum infection. Patients typically present with fever, severe tenderness of the uterine fundus, and mucopurulent vaginal discharge. Risk factors for endometritis include premature or prolonged rupture of membranes, prolonged labor, cesarean delivery (as in this patient), bacterial vaginosis, group B *Streptococcus* colonization, and manual removal of the placenta. Treatment requires broad-spectrum antibiotics such as clindamycin and gentamicin for appropriate antimicrobial coverage.

Incorrect Answers: A, B, C, and D.

Observation only (Choice A) would be inappropriate in this patient with likely endometritis, which requires urgent broad-spectrum antibiotic therapy.

Breast binding (Choice B) is sometimes utilized to suppress lactation in women who opt against breastfeeding. This patient's mild breast induration likely reflects

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D) Endometrial culture

E) Antibiotic therapy

Correct Answer: E.

A postpartum patient with fever and severe uterine tenderness raises suspicion for endometritis. Postpartum endometritis is an acute, typically polymicrobial infection of the uterine endometrium involving a mixture of aerobes and anaerobes from the genital tract. During labor and delivery, microbes from the genital tract can enter the uterine cavity and colonize bleeding or damaged uterine tissue, resulting in postpartum infection. Patients typically present with fever, severe tenderness of the uterine fundus, and mucopurulent vaginal discharge. Risk factors for endometritis include premature or prolonged rupture of membranes, prolonged labor, cesarean delivery (as in this patient), bacterial vaginosis, group B *Streptococcus* colonization, and manual removal of the placenta. Treatment requires broad-spectrum antibiotics such as clindamycin and gentamicin for appropriate antimicrobial coverage.

Incorrect Answers: A, B, C, and D.

Observation only (Choice A) would be inappropriate in this patient with likely endometritis, which requires urgent broad-spectrum antibiotic therapy.

Breast binding (Choice B) is sometimes utilized to suppress lactation in women who opt against breastfeeding. This patient's mild breast induration likely reflects engorgement, but her breastfeeding preferences are unknown. As well, she likely has endometritis that requires urgent antibiotic therapy.

Incentive spirometry (Choice C) is an initial step in the management of atelectasis. In pregnant patients or patients who have just undergone vaginal or cesarean delivery, increased intra-abdominal pressure caused by the gravid uterus pushes on the diaphragm and intrathoracic cavity, decreasing the ability for the lungs to expand normally. This increases the risk for atelectasis, which can cause a mild fever within 2 days after delivery. However, a tender uterine fundus is more consistent with endometritis.

Endometrial cultures (Choice D) are not typically collected in suspected endometritis because of the risk for contamination by cervical flora and limited clinical utility.

Educational Objective: Postpartum endometritis is an acute, typically polymicrobial, infection of the uterine endometrium involving a mixture of aerobes and anaerobes from the genital tract. It is common in patients who have undergone cesarean delivery. Patients typically present with fever, severe tenderness of the uterine fundus, and mucopurulent vaginal discharge.

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31. A 51-year-old woman, gravida 1, para 1, comes to the office for an annual health maintenance examination. She says she has been generally healthy and feels well but is concerned about her risk for ovarian cancer because her friend of the same age recently was diagnosed with such cancer. Medical history is significant for an uncomplicated pregnancy and vaginal delivery. She breast-fed her child until he was age 6 months. Her only medications are a calcium supplement and daily multivitamin. She took an oral contraceptive for 15 years and discontinued the therapy 1 year ago; her menses did not resume after discontinuing the therapy. She has not taken hormone replacement therapy. She exercises regularly and does not smoke cigarettes. She has no known family history of cancer. All Pap smears in the past have shown no abnormalities. She is 173 cm (5 ft 8 in) tall and weighs 63 kg (139 lb); BMI is 21 kg/m^2. Vital signs are normal. Physical examination, including pelvic examination, discloses no abnormalities. Which of the following factors in the patient's history is most strongly associated with a decreased risk for ovarian cancer?

A) Absence of family history of ovarian cancer
B) BMI
C) Breast-feeding history
D) Negative smoking history
E) Oral contraceptive use
F) Postmenopausal status

Correct Answer: E.

Ovarian cancer classically presents indolently in an older, postmenopausal female patient with abdominal distention and weight loss. It is hypothesized that an increased number of ovulatory cycles over a patient's lifetime increases the likelihood of ovarian cancer, so factors leading to more ovulatory cycles such early menarche, nulliparity, decreased fertility, delayed childbearing, and late menopause increase the risk for ovarian cancer. Family history of ovarian cancer or the presence of a genetic mutation (*BRCA1* or *BRCA2*) also increase the risk for ovarian cancer. In contrast, protective factors that decrease the number of ovulatory cycles such as breastfeeding and multiple pregnancies decrease the risk for ovarian cancer. Oral contraceptives taken for over 5 years have also been repeatedly shown to significantly decrease the risk for ovarian cancer by nearly 30%. The strongest protective factor, though not present in this patient, is bilateral salpingo-oophorectomy. In this case, this patient's history of oral contraceptive use for over 5 years is her strongest protective factor against ovarian cancer.

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Incorrect Answer: A, B, C, D, and F.

This patient's risk for ovarian cancer will be most decreased by her oral contraceptive use rather than her absence of family history of ovarian cancer (Choice A). Approximately 10% of ovarian cancers occur in patients with a genetic predisposition such as *BRCA1*, *BRCA2*, or Lynch syndrome. The remaining 90% occur sporadically. The absence of a family history of ovarian cancer will decrease her risk slightly, but most patients with ovarian cancer lack a family history of the condition.

BMI (Choice B) does not conclusively increase the risk for ovarian cancer, so this patient's normal BMI does not necessarily decrease her risk. Increased BMI is a significant risk factor for endometrial cancer but not ovarian cancer.

Breast-feeding history (Choice C) may slightly decrease this patient's risk for ovarian cancer. She may also have a slightly decreased risk compared with a nulliparous woman because of her history of one pregnancy. However, neither are as impactful as the decrease in risk beacuse of oral contraceptive use.

Negative smoking history (Choice D) does not decrease this patient's risk since there is no clear evidence that smoking increases the risk for ovarian cancer. However, smoking does decrease the overall survival of patients who develop ovarian cancer.

Postmenopausal status (Choice F) is associated with an increased risk for ovarian cancer as a result of it being associated with older age. Most ovarian cancer occurs in women over the age of 50 years who are postmenopausal. Thus, being postmenopausal does not decrease this patient's risk for ovarian cancer but instead increases it.

Educational Objective: Risk factors for ovarian cancer include early menarche or late menopause, nulliparity, decreased fertility, delayed childbearing, family history, and the presence of a genetic mutation. Protective factors include bilateral salpingo-oophorectomy, use of oral contraceptives for over 5 years, lactation, and multiple pregnancies.

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32. A 17-year-old boy is brought to the physician for an examination prior to participation in sports. He has no history of serious illness and takes no medications. He was diagnosed with intellectual developmental disorder at the age of 5 years. He is 165 cm (5 ft 5 in) tall and weighs 50 kg (110 lb); BMI is 18 kg/m^2. Vital signs are within normal limits. Examination shows minimal facial hair. There is mild bilateral gynecomastia. The testes are Tanner stage 1. Which of the following is the most likely explanation for this patient's gynecomastia?

A) Congenital adrenal hyperplasia
B) Constitutional delay of puberty
C) Incomplete androgen insensitivity syndrome
D) Seminiferous tubule dysgenesis (Klinefelter) syndrome
E) Normal variant of puberty

Correct Answer: D.

Seminiferous tubule dysgenesis (Klinefelter) syndrome is caused by an XXY genotype with symptoms secondary to decreased testosterone production and absent sperm production in the setting of fibrotic seminiferous tubules and Leydig cells. Phenotypic variability occurs, but the common presentation includes cryptorchidism or small testes, learning disabilities or behavioral issues, delayed pubertal development, signs of androgen deficiency (eg, gynecomastia), and infertility, often in a patient who is tall with a disproportionate leg-to-arm length. Laboratory evaluation will show increased follicle-stimulating hormone (FSH) and luteinizing hormone (LH) with low testosterone. Diagnosis is made through karyotype analysis. Treatment is supportive with testosterone supplementation and counseling.

Incorrect Answers: A, B, C, and E.

Congenital adrenal hyperplasia (CAH) (Choice A) defines a variable state of disease related to adrenal hypofunction that results in decreased concentrations of cortisol with variable effects on mineralocorticoids and androgens. The presentation varies depending on the age of onset, severity, and sex of the patient. In rare, mild cases, infertility may be the only presenting complaint when diagnosed in adolescence or young adulthood. Most cases of CAH, however, are diagnosed in childhood.

Constitutional delay of puberty (Choice B) is a normal variant of puberty that occurs as a result of a transient defect in the production of gonadotropin-releasing hormone

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Incorrect Answers: A, B, C, and E.

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Constitutional delay of puberty (Choice B) is a normal variant of puberty that occurs as a result of a transient defect in the production of gonadotropin-releasing hormone with resultant delay in the stimulation of pituitary production of FSH and LH. It is frequently seen in patients with a familial history of delayed puberty. This patient has yet to undergo testicular enlargement, the first sign of pubertal development in boys, at age 17 years, making a pathologic cause of delayed puberty and gynecomastia more likely.

Incomplete androgen insensitivity syndrome (Choice C) can cause a variety of phenotypes, including a female phenotype with virilization to a male phenotype with lack of secondary sexual characteristics or infertility. The phenotypically male patients commonly have a micropenis, hypospadias, gynecomastia, and minimal body hair. This patient does not display the physical characteristics of androgen insensitivity syndrome.

Normal variant of puberty (Choice E) is incorrect. Physiologic pubertal gynecomastia is a benign proliferation of glandular breast tissue in boys aged 12 to 14 years, most commonly during Tanner stage 3 of puberty. This patient is older than would be expected for physiologic gynecomastia and also has delayed pubertal development in the setting of intellectual disability, making Klinefelter syndrome more likely.

Educational Objective: Klinefelter syndrome is caused by an XXY genotype with a variable presentation that commonly includes cryptorchidism or small testes, learning disabilities or behavioral issues, delayed pubertal development, signs of androgen deficiency (eg, gynecomastia), infertility, and a tall stature with disproportionate arm-to-leg length. Symptoms are caused by a lack of testosterone production secondary to fibrotic seminiferous tubules and Leydig cells.

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33. A 16-year-old boy with type 1 diabetes mellitus is brought to the emergency department by his parents because of a 1-hour history of vomiting. The parents say he was at an overnight camp during the past week. When he returned 12 hours ago, he was not as active as usual and said he was tired. The patient told his parents that he had taken his insulin while at camp, but when they checked his bag, his supply of insulin indicated that he had not been taking it regularly. On arrival, he appears ill and drowsy but fully oriented. There is a sweet odor to his breath. His temperature is 37°C (98.6°F), pulse is 120/min, respirations are 26/min and deep, and blood pressure is 115/60 mm Hg. Examination shows dry mucous membranes. No other abnormalities are noted. Laboratory studies show:

Fingerstick blood glucose	>600 mg/dL
Serum HCO_3^-	10 mEq/L

Arterial blood gas analysis on room air shows:

pH	7.13
Pco_2	32 mm Hg
Po_2	95 mm Hg

Administration of which of the following is the most appropriate initial step in management?

A) Intramuscular promethazine
B) Intravenous bicarbonate
C) Intravenous insulin
D) Intravenous 0.9% saline bolus
E) Subcutaneous insulin
F) Sublingual ondansetron

Correct Answer: D.

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Administration of which of the following is the most appropriate initial step in management?

A) Intramuscular promethazine
B) Intravenous bicarbonate
C) Intravenous insulin
D) Intravenous 0.9% saline bolus
E) Subcutaneous insulin
F) Sublingual ondansetron

Correct Answer: D.

Diabetic ketoacidosis (DKA) presents with fatigue, polyuria, polydipsia, shortness of breath or tachypnea, and diffuse abdominal discomfort, most commonly in patients with type 1 diabetes mellitus. It is caused by the accumulation of serum ketones such as β-hydroxybutyric acid, acetoacetic acid, and acetone in the setting of insulin deficiency or acute catabolic stressors such as infection. Dysregulated fatty acid degradation and ketone synthesis occurs because of the relative state of starvation created by absent insulin signaling. Vital signs may show tachycardia, tachypnea, and hypotension as a result of severe hypovolemia, which occurs secondary to osmotic diuresis from hyperglycemia. Patients may demonstrate physical examination signs of hypovolemia (eg, dry mucous membranes, decreased skin turgor) along with a sweet breath odor secondary to ketones. Laboratory analysis typically demonstrates increased serum glucose and ketones, metabolic acidosis, and a high anion gap caused by the accumulation of unmeasured anions in serum. Metabolic acidosis is accompanied by a decreased bicarbonate concentration in the serum, since bicarbonate is consumed in the neutralization of increased acidic molecules (hydrogen ions) in the blood. Patients commonly demonstrate respiratory compensation (an increased respiratory rate and consequently decreased Pco_2). The initial management of DKA should focus on volume repletion with isotonic fluids such as normal saline, which is crucial to hemodynamically stabilize the patient, restore tissue perfusion, and clear ketones. Volume repletion should be followed by insulin, correction of electrolyte abnormalities, and treatment of any precipitating conditions.

Incorrect Answers: A, B, C, E, and F.

Intramuscular promethazine (Choice A) is an antihistamine medication utilized for nausea and allergic reactions. Sublingual ondansetron (Choice F) is a selective serotonin antagonist that treats nausea. Treatment of this patient's hypovolemia and DKA are more medically urgent. As well, his nausea is likely to improve with treatment of his underlying DKA.

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Diabetic ketoacidosis (DKA) presents with fatigue, polyuria, polydipsia, shortness of breath or tachypnea, and diffuse abdominal discomfort, most commonly in patients with type 1 diabetes mellitus. It is caused by the accumulation of serum ketones such as β-hydroxybutyric acid, acetoacetic acid, and acetone in the setting of insulin deficiency or acute catabolic stressors such as infection. Dysregulated fatty acid degradation and ketone synthesis occurs because of the relative state of starvation created by absent insulin signaling. Vital signs may show tachycardia, tachypnea, and hypotension as a result of severe hypovolemia, which occurs secondary to osmotic diuresis from hyperglycemia. Patients may demonstrate physical examination signs of hypovolemia (eg, dry mucous membranes, decreased skin turgor) along with a sweet breath odor secondary to ketones. Laboratory analysis typically demonstrates increased serum glucose and ketones, metabolic acidosis, and a high anion gap caused by the accumulation of unmeasured anions in serum. Metabolic acidosis is accompanied by a decreased bicarbonate concentration in the serum, since bicarbonate is consumed in the neutralization of increased acidic molecules (hydrogen ions) in the blood. Patients commonly demonstrate respiratory compensation (an increased respiratory rate and consequently decreased Pco_2). The initial management of DKA should focus on volume repletion with isotonic fluids such as normal saline, which is crucial to hemodynamically stabilize the patient, restore tissue perfusion, and clear ketones. Volume repletion should be followed by insulin, correction of electrolyte abnormalities, and treatment of any precipitating conditions.

Incorrect Answers: A, B, C, E, and F.

Intramuscular promethazine (Choice A) is an antihistamine medication utilized for nausea and allergic reactions. Sublingual ondansetron (Choice F) is a selective serotonin antagonist that treats nausea. Treatment of this patient's hypovolemia and DKA are more medically urgent. As well, his nausea is likely to improve with treatment of his underlying DKA.

Intravenous bicarbonate (Choice B) lacks evidence of efficacy in treating DKA. The metabolic acidosis is likely to improve with volume and insulin repletion instead.

A continuous intravenous insulin (Choice C) infusion is an early management step that should follow volume repletion. Volume repletion should be prioritized to hemodynamically stabilize the patient. Once the ketoacidosis has resolved and oral intake resumes, intravenous insulin is converted to a subcutaneous insulin (Choice E) regimen.

Educational Objective: Diabetic ketoacidosis presents with fatigue, polyuria, polydipsia, shortness of breath, and diffuse abdominal pain caused by a deficiency of insulin signaling, most commonly in type 1 diabetes mellitus. The first step in management is volume repletion with isotonic fluids, closely followed by intravenous insulin infusion and electrolyte correction.

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34. A 32-year-old woman comes to the physician because of a 2-week history of double vision and dry, red eyes. She also has had a 4.5-kg (10-lb) weight loss and increased fatigability during this time. Her only medication is an oral contraceptive. She is 163 cm (5 ft 4 in) tall and weighs 50 kg (110 lb); BMI is 19 kg/m^2. Her temperature is 37.2°C (99°F), pulse is 100/min, respirations are 16/min, and blood pressure is 135/60 mm Hg. Examination shows prominent-appearing eyes and bilateral scleral injection. She has limited upward gaze, and she reports severe diplopia when she looks up; the eyes open wider on downward gaze. Visual acuity is 20/40 in the left eye and 20/30 in the right. Which of the following is the most appropriate next step in diagnosis?

A) Schirmer test
B) Acetylcholine receptor antibody titers
C) Measurement of serum angiotensin-converting enzyme activity
D) Measurement of serum glucose concentration
E) Thyroid function testing

Correct Answer: E.

Graves disease is the most common cause of hyperthyroidism in high-resource nations and occurs because of the presence of TSH receptor-stimulating antibodies. This results in a diffusely enlarged thyroid gland on physical examination, along with signs and symptoms of hyperthyroidism including weight loss, insomnia, palpitations, heat intolerance, tremor, diaphoresis, and pretibial myxedema. TSH receptor-stimulating antibodies also stimulate orbital fibroblasts and can lead to thyroid ophthalmopathy, which is characterized by the expansion of orbital fat and connective tissue with resultant exophthalmos, lid lag, and restrictive strabismus. Thyroid function testing typically discloses increased concentrations of triiodothyronine (T_3) and thyroxine (T_4), and decreased TSH. Additional testing for TSH receptor-stimulating antibodies confirms the diagnosis. Radioactive iodine uptake nuclear scintigraphy typically demonstrates diffuse, abnormally increased uptake of the thyroid gland without a discrete nodule. Treatment options include antithyroid drugs, radioiodine ablation, and surgery.

Incorrect Answers: A, B, C, and D.

Schirmer test (Choice A) is used to evaluate excessive dryness or watering of the eyes by using a test strip to measure the amount of lacrimal fluid produced in a set amount of time. It is used in patients with Sjögren syndrome to assess for aqueous tear deficiency.

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Correct Answer: E.

Graves disease is the most common cause of hyperthyroidism in high-resource nations and occurs because of the presence of TSH receptor-stimulating antibodies. This results in a diffusely enlarged thyroid gland on physical examination, along with signs and symptoms of hyperthyroidism including weight loss, insomnia, palpitations, heat intolerance, tremor, diaphoresis, and pretibial myxedema. TSH receptor-stimulating antibodies also stimulate orbital fibroblasts and can lead to thyroid ophthalmopathy, which is characterized by the expansion of orbital fat and connective tissue with resultant exophthalmos, lid lag, and restrictive strabismus. Thyroid function testing typically discloses increased concentrations of triiodothyronine (T_3) and thyroxine (T_4), and decreased TSH. Additional testing for TSH receptor-stimulating antibodies confirms the diagnosis. Radioactive iodine uptake nuclear scintigraphy typically demonstrates diffuse, abnormally increased uptake of the thyroid gland without a discrete nodule. Treatment options include antithyroid drugs, radioiodine ablation, and surgery.

Incorrect Answers: A, B, C, and D.

Schirmer test (Choice A) is used to evaluate excessive dryness or watering of the eyes by using a test strip to measure the amount of lacrimal fluid produced in a set amount of time. It is used in patients with Sjögren syndrome to assess for aqueous tear deficiency.

Acetylcholine receptor antibody titers (Choice B) are measured to evaluate for myasthenia gravis, which commonly presents with ptosis, diplopia, dysphagia, and muscle weakness, which are worse with repetitive activity and later in the day. This patient's generalized fatigue without report of weakness is more consistent with Graves disease.

Measurement of serum angiotensin-converting enzyme activity (Choice C) can be useful in making a diagnosis of sarcoidosis. Patients may present with uveitis with eye pain, erythema, and blurred vision. Isolated uveitis would be an uncommon presentation of sarcoidosis, and Graves disease is a more likely explanation.

Measurement of serum glucose concentration (Choice D) is not likely to disclose the diagnosis. Symptomatic diabetic retinopathy is typically a late manifestation of suboptimally controlled diabetes mellitus and presents with progressive vision loss.

Educational Objective: Graves disease is caused by TSH receptor-stimulating antibodies. Signs and symptoms include weight loss, insomnia, palpitations, heat intolerance, tremor, diaphoresis, pretibial myxedema, a diffusely enlarged thyroid gland, thyroid ophthalmopathy, and pretibial myxedema. Laboratory evaluation shows increased thyroxine and triiodothyronine, decreased TSH, and the presence of TSH receptor-stimulating antibodies.

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35. A 42-year-old woman is brought to the emergency department 30 minutes after her husband found her unconscious in her bed. She has a 6-year history of systemic lupus erythematosus treated with prednisone. Her husband says she has been on a drinking binge for the past 7 days and has not been eating. Three days ago, she had the onset of rhinitis, conjunctivitis, and a nonproductive cough. She has a long-standing history of alcoholism. She moans in response to painful stimuli. Her temperature is 38.9°C (102°F), pulse is 110/min, respirations are 22/min, and palpable systolic blood pressure is 80 mm Hg. The lungs are clear to auscultation and percussion. Abdominal examination shows no abnormalities. Fluid resuscitation is begun. Which of the following is the most appropriate initial step in management?

A) Serum antinuclear antibody assay
B) Corticosteroid therapy
C) Cyclosporine therapy
D) Ganciclovir therapy
E) Nonsteroidal anti-inflammatory drug therapy

Correct Answer: B.

Immediate initiation of corticosteroid therapy is the most appropriate next step in management for this patient suffering hemodynamic collapse as a result of adrenal crisis. Chronic use of exogenous corticosteroids (such as for management of autoimmune disease) results in decreased production of adrenocorticotropic hormone from the pituitary gland, with subsequent atrophy of the bilateral adrenal glands and diminished native production of corticosteroids. Adrenal crisis can be precipitated by a physiologic stressor (eg, surgery, trauma, infection) that acutely increases the body's demand for corticosteroids, which cannot be met because of chronic adrenal gland atrophy. The patient has also likely not been able to take her oral medications in the setting of a drinking binge and not eating. Adrenal insufficiency presents with hypoglycemia, altered mental status, hyponatremia, tachycardia, and abnormal vasodilation. Adrenal crisis is marked by significant volume depletion and fluid- and vasopressor-refractory hypotension. While difficult to diagnose because of its nonspecific presentation, acute adrenal crisis should be considered in the differential of any patient presenting with circulatory collapse. Treatment requires the administration of intravenous corticosteroids to improve systemic vascular resistance and restore hemodynamic stability.

Incorrect Answers: A, C, D, and E.

Serum antinuclear antibody assay (Choice A) would not be helpful in the diagnosis of the patient's acute condition. Antinuclear antibodies are useful in establishing a

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Immediate initiation of corticosteroid therapy is the most appropriate next step in management for this patient suffering hemodynamic collapse as a result of adrenal crisis. Chronic use of exogenous corticosteroids (such as for management of autoimmune disease) results in decreased production of adrenocorticotropic hormone from the pituitary gland, with subsequent atrophy of the bilateral adrenal glands and diminished native production of corticosteroids. Adrenal crisis can be precipitated by a physiologic stressor (eg, surgery, trauma, infection) that acutely increases the body's demand for corticosteroids, which cannot be met because of chronic adrenal gland atrophy. The patient has also likely not been able to take her oral medications in the setting of a drinking binge and not eating. Adrenal insufficiency presents with hypoglycemia, altered mental status, hyponatremia, tachycardia, and abnormal vasodilation. Adrenal crisis is marked by significant volume depletion and fluid- and vasopressor-refractory hypotension. While difficult to diagnose because of its nonspecific presentation, acute adrenal crisis should be considered in the differential of any patient presenting with circulatory collapse. Treatment requires the administration of intravenous corticosteroids to improve systemic vascular resistance and restore hemodynamic stability.

Incorrect Answers: A, C, D, and E.

Serum antinuclear antibody assay (Choice A) would not be helpful in the diagnosis of the patient's acute condition. Antinuclear antibodies are useful in establishing a diagnosis of lupus. Acute flares and increased disease activity are better evaluated with a complete blood count, erythrocyte sedimentation rate, C-reactive protein, urinalysis and urine protein measurements, and complement concentrations. With the exception of anti-dsDNA antibodies, antinuclear antibody concentrations do not correlate with symptomatic disease activity.

Cyclosporine therapy (Choice C) is a potent immunosuppressant used for the acute and chronic treatment of certain autoimmune diseases and to prevent rejection in organ transplantation. It is not indicated for management of this patient's acute adrenal crisis.

Ganciclovir therapy (Choice D) is used to treat cytomegalovirus (CMV) infection, which is a common complication in patients who require significant immunosuppression for management of autoimmune disease. CMV infection does not likely explain the patient's presentation.

Nonsteroidal anti-inflammatory drug therapy (Choice E) can be helpful for acute flares and chronic pain associated with autoimmune disease.

Educational Objective: Adrenal crisis is a medical emergency resulting in refractory hypotension and circulatory collapse caused by the inadequate availability of endogenous or exogenous corticosteroids to meet physiologic demands. Patients who require long durations of steroid therapy are at risk for adrenal gland atrophy and adrenal crisis in the setting of an acute stressor.

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36. A 3-year-old girl is brought to the emergency department after her mother found her in the kitchen next to an open bottle of drain cleaner that had been stored under the sink. The bottle was still almost full, but some of its contents were spilled on the patient's clothes and on the floor. On arrival, she is alert, crying, and drooling but in no respiratory distress. Her pulse is 120/min, respirations are 30/min, and blood pressure is 95/70 mm Hg. The mouth and oral mucosa is bright red, but there are no ulcers in the oropharynx. The lungs are clear to auscultation. Abdominal examination shows no abnormalities. The extremities are well perfused. An x-ray of the chest shows clear lung fields and normal cardiac silhouette and mediastinum. Which of the following is the most appropriate next step in management?

A) Barium swallow
B) Administration of activated charcoal
C) Administration of ipecac
D) Esophagoscopy
E) Gastric lavage by nasogastric tube

Correct Answer: D.

Drain cleaners are a common cause of caustic ingestions in children. They contain sodium and potassium hydroxides, alkali that are proton acceptors and strong nucleophiles. Alkali ingestion leads to liquefactive necrosis, lactic acidosis, and tissue penetration and ulceration. It can cause chemical burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and drooling. If severe, esophageal perforation can ensue, leading to free air in the mediastinum, known as Boerhaave syndrome, a surgical emergency. Treatment is initially focused on supportive measures including airway management and fluid resuscitation. Visible lesions in the oropharynx increase the likelihood of distal gastrointestinal lesions. Patients should be emergently evaluated with esophagoscopy (endoscopy) to assess for visceral injury and guide management. For severe injuries, treatment involves steroid administration. In contrast to many toxic ingestions, activated charcoal is contraindicated because of the coating of ulcerated mucosa, potential for extraluminal spread into the mediastinum, and impairment of visualization on endoscopy.

Incorrect Answers: A, B, C, and E.

A barium swallow (Choice A) is a fluoroscopic study typically used to evaluate oropharyngeal and esophageal swallowing function in patients with dysphagia. If the patient

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D) Esophagoscopy

E) Gastric lavage by nasogastric tube

Correct Answer: D.

Drain cleaners are a common cause of caustic ingestions in children. They contain sodium and potassium hydroxides, alkali that are proton acceptors and strong nucleophiles. Alkali ingestion leads to liquefactive necrosis, lactic acidosis, and tissue penetration and ulceration. It can cause chemical burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and drooling. If severe, esophageal perforation can ensue, leading to free air in the mediastinum, known as Boerhaave syndrome, a surgical emergency. Treatment is initially focused on supportive measures including airway management and fluid resuscitation. Visible lesions in the oropharynx increase the likelihood of distal gastrointestinal lesions. Patients should be emergently evaluated with esophagoscopy (endoscopy) to assess for visceral injury and guide management. For severe injuries, treatment involves steroid administration. In contrast to many toxic ingestions, activated charcoal is contraindicated because of the coating of ulcerated mucosa, potential for extraluminal spread into the mediastinum, and impairment of visualization on endoscopy.

Incorrect Answers: A, B, C, and E.

A barium swallow (Choice A) is a fluoroscopic study typically used to evaluate oropharyngeal and esophageal swallowing function in patients with dysphagia. If the patient demonstrated pneumomediastinum on diagnostic imaging, and there was concern for an esophageal perforation, fluoroscopic evaluation with a water-soluble contrast agent (eg, meglumine diatrizoate) could be performed.

Administration of activated charcoal (Choice B) would be unlikely to be beneficial and would not be safe in a patient who is drooling and has likely tissue injury secondary to alkali ingestion. Charcoal, if aspirated, can be harmful to the pulmonary parenchyma and cause aspiration pneumonitis.

Administration of ipecac (Choice C) is not recommended and may be harmful in alkali ingestion because of possible further tissue injury. While historically ipecac was used to treat numerous types of oral toxin ingestions, it is no longer widely recommended because of limited established benefit and potential risk for harm. Similarly, gastric lavage (Choice E) was a common gastric decontamination procedure for oral toxic ingestions that is no longer widely recommended.

Educational Objective: Drain cleaners contain caustic alkali that can cause burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and drooling. Esophagoscopy should be emergently performed to evaluate the extent of visceral injury to guide treatment and management.

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37. A 9-year-old boy is brought to the office by his parents because of bilateral groin hernias discovered by a nurse on examination 5 days ago at an urgent care clinic. The patient's parents are migrant agricultural workers, and the patient's medical care has been inconsistent and infrequent. The parents say their son has no history of serious illness; he has only occasional upper respiratory tract infections that resolve after treatment with over-the-counter medications. The patient currently receives no medications. The nurse reports that she administered several routine vaccines to the patient because he had not received them yet. He is at the 80th percentile for height and 20th percentile for weight. Examination shows an elongated face, droopy eyelids, and mild scoliosis. There is mild pectus carinatum. Cardiopulmonary and abdominal examinations show no abnormalities. The distance encompassed by the patient's outstretched upper extremities is 1.2 times his height. On Valsalva maneuver, bilateral hernias below the inguinal ligaments are easily reducible. In addition to scheduling operative repair of the hernias, which of the following is the most appropriate next step in management?

A) Echocardiography
B) Karyotype analysis
C) MRI of the spine
D) Pulmonary function tests
E) Tonometry

Correct Answer: A.

This patient's clinical findings of inguinal hernias, elongated face, droopy eyelids, scoliosis, pectus carinatum, and long extremities are consistent with a diagnosis of Marfan syndrome. Patients with Marfan syndrome may also display tall stature, a high, narrow palate, pectus excavatum, and joint hyperextensibility. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications. Annual ophthalmic examination should be performed to identify characteristic features such as ectopia lentis, as well as myopia, iris transillumination defects, iridodonesis, or phacodonesis, and to prevent complications such as cataract, glaucoma, or retinal detachment.

Incorrect Answers: B, C, D, and E

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This patient's clinical findings of inguinal hernias, elongated face, droopy eyelids, scoliosis, pectus carinatum, and long extremities are consistent with a diagnosis of Marfan syndrome. Patients with Marfan syndrome may also display tall stature, a high, narrow palate, pectus excavatum, and joint hyperextensibility. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications. Annual ophthalmic examination should be performed to identify characteristic features such as ectopia lentis, as well as myopia, iris transillumination defects, iridodonesis, or phacodonesis, and to prevent complications such as cataract, glaucoma, or retinal detachment.

Incorrect Answers: B, C, D, and E.

Karyotype analysis (Choice B) is useful for the diagnosis of chromosomal disorders, such as seminiferous tubule dysgenesis (Klinefelter syndrome) or Down syndrome. Marfan syndrome is caused by mutation of a single gene and does not manifest abnormal karyotyping.

MRI of the spine (Choice C) is not necessary for the diagnosis or evaluation of Marfan syndrome. Some patients with Marfan syndrome display atlantoaxial instability or enlarged sacral foraminal openings. Screening echocardiography and ophthalmic examination are more essential to prevent complications.

Pulmonary function tests (Choice D) are not typically useful for the diagnosis of Marfan syndrome. Patients with Marfan syndrome typically display normal pulmonary function.

Tonometry (Choice E) is useful for screening for glaucoma, a potential complication of Marfan syndrome. However, an annual, complete ophthalmic examination, rather than tonometry alone, is a more appropriate step.

Educational Objective: Marfan syndrome presents with characteristic physical features including tall stature, an elongated face, a high, narrow palate, droopy eyelids, ectopia lentis, pectus excavatum, pectus carinatum, long extremities, and joint hyperextensibility. Patients with Marfan syndrome are at increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography screening and annual ophthalmic examination.

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38. A prospective cohort study is conducted to assess the likelihood of undergoing repeat cesarean delivery after a trial of labor with or without oxytocin. Oxytocin use and mode of delivery are recorded from hospital records for all deliveries in one calendar year. The results show:

		Repeat Cesarean Delivery		
		Yes	No	Total
Use of Oxytocin	Yes	160	840	1000
	No	320	680	1000
	Total	480	1520	2000

Based on these results, which of the following represents the relative risk for a repeat cesarean delivery with oxytocin use?

A) 0.16
B) 0.33
C) 0.50
D) 0.67
E) 0.84

Correct Answer: C.

Relative risk (RR) describes the difference in likelihood of the occurrence of a particular disease outcome between two groups of patients with or without a particular exposure. In this case, the outcome is repeat cesarean delivery and oxytocin is the exposure. Calculations of relative risk are commonly performed in cohort studies. RR is calculated by dividing the fraction of patients with a positive exposure and who developed disease (a) amongst all patients who were exposed (a + b) by the fraction of patients with a negative exposure and who developed disease (c) amongst all patients who were not exposed (c + d). RR thus equals (a / (a + b)) / (c / (c + d)). In this case, the RR is calculated as follows: RR = (160 / (1000)) / (320 / (1000)) = 0.16 / 0.32 = 0.5. RR values greater than 1.0 indicate an increased risk for developing disease in association with the exposure, whereas values less than 1.0 indicate a decreased risk for developing disease, and RR equal to 1.0 indicates that the disease outcome and the exposure are not related (that the risk is the same between the groups). In this case, the relative risk of 0.5 suggests that there is decreased risk for repeat

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C) 0.50

D) 0.67

E) 0.84

Correct Answer: C.

Relative risk (RR) describes the difference in likelihood of the occurrence of a particular disease outcome between two groups of patients with or without a particular exposure. In this case, the outcome is repeat cesarean delivery and oxytocin is the exposure. Calculations of relative risk are commonly performed in cohort studies. RR is calculated by dividing the fraction of patients with a positive exposure and who developed disease (a) amongst all patients who were exposed (a + b) by the fraction of patients with a negative exposure and who developed disease (c) amongst all patients who were not exposed (c + d). RR thus equals (a / (a + b)) / (c / (c + d)). In this case, the RR is calculated as follows: RR = (160 / (1000)) / (320 / (1000)) = 0.16 / 0.32 = 0.5. RR values greater than 1.0 indicate an increased risk for developing disease in association with the exposure, whereas values less than 1.0 indicate a decreased risk for developing disease, and RR equal to 1.0 indicates that the disease outcome and the exposure are not related (that the risk is the same between the groups). In this case, the relative risk of 0.5 suggests that there is decreased risk for repeat cesarean delivery in patients who received oxytocin compared with those who did not.

Incorrect Answers: A, B, D, and E.

0.16 (Choice A) is the rate of repeat cesarean delivery in patients who received oxytocin. However, it must be divided by the rate of repeat cesarean delivery in patients who did not receive oxytocin to calculate the RR.

0.33 (Choice B) is the percentage of patients who underwent a repeat cesarean delivery that received oxytocin while 0.67 (Choice D) is the percentage of patients who underwent a repeat cesarean delivery but did not receive oxytocin. Neither is used in calculating RR.

0.84 (Choice E) is the percentage of patients who received oxytocin and did not require a repeat cesarean delivery. This rate is not used in calculating RR.

Educational Objective: Relative risk describes the risk for developing a disease in a group with a particular exposure divided by the risk for developing a disease in a group without the exposure. RR equals (a / (a + b)) / (c / (c + d)).

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39. A study is conducted to assess the efficacy of a new drug for treatment of pruritus secondary to primary sclerosing cholangitis (PSC). A total of 300 patients with PSC are enrolled and randomly assigned to one of two groups: 150 patients receive the new drug (Drug X), and 150 patients receive the placebo. Pruritus is evaluated at the start of the study and after 1 week of treatment. The results show:

	Number of Patients	
Group	**Pruritus at 1 Week**	**Adverse Events**
Drug X	40	25
Placebo	90	18

Based on these data, which of the following represents the number needed to treat for 1 week with Drug X to prevent one case of PSC pruritus in this population?

A) 3
B) 7
C) 40
D) 50
E) Cannot be determined from the data provided

Correct Answer: A.

Number needed to treat (NNT) is an epidemiologic measure used to characterize an intervention that clarifies the effectiveness of that intervention. Formally, the NNT is the number of patients who must receive an intervention to prevent the occurrence of one negative outcome. For example, if Drug X needs to be given to 10 people to relieve pruritus in one patient, it would have an NNT of 10. In this study, the rate of pruritus in the Drug X group (experimental group) is 40/150 = 27%, whereas the rate of pruritus in the placebo group (control group) is 90/150 = 60%. Finding the difference between these two risks provides the absolute risk reduction (ARR) of Drug X, 60% - 27% = 33% = 0.33. NNT is related to the ARR via the following equation: NNT=1/ARR. Thus, in this case NNT is equal to 1/0.33 = 3. In other words, if three primary sclerosing cholangitis patients are treated, one patient would stand to benefit from the treatment. The NNT is a useful measure for the evaluation of an intervention, since it can be intuitively understood by clinicians and the general population, whereas relative risk reduction and absolute risk reduction calculations are more abstract and difficult to translate to the number of people helped by an intervention

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C) 40

D) 50

E) Cannot be determined from the data provided

Correct Answer: A.

Number needed to treat (NNT) is an epidemiologic measure used to characterize an intervention that clarifies the effectiveness of that intervention. Formally, the NNT is the number of patients who must receive an intervention to prevent the occurrence of one negative outcome. For example, if Drug X needs to be given to 10 people to relieve pruritus in one patient, it would have an NNT of 10. In this study, the rate of pruritus in the Drug X group (experimental group) is 40/150 = 27%, whereas the rate of pruritus in the placebo group (control group) is 90/150 = 60%. Finding the difference between these two risks provides the absolute risk reduction (ARR) of Drug X, 60% - 27% = 33% = 0.33. NNT is related to the ARR via the following equation: NNT=1/ARR. Thus, in this case NNT is equal to 1/0.33 = 3. In other words, if three primary sclerosing cholangitis patients are treated, one patient would stand to benefit from the treatment. The NNT is a useful measure for the evaluation of an intervention, since it can be intuitively understood by clinicians and the general population, whereas relative risk reduction and absolute risk reduction calculations are more abstract and difficult to translate to the number of people helped by an intervention.

Incorrect Answers: B, C, D, and E.

7 (Choice B) would be the NNT if the absolute risk reduction were 0.14 or 14%. 50 (Choice D) would be the NNT if the absolute risk reduction were 0.02 or 2%. In this case, however, the ARR is 33%.

40 (Choice C) is the number of patients who received Drug X that have pruritus at week 1. To calculate NNT, the rate of the event (eg, 40/150) rather than the total number of events is used.

It is false that NNT cannot be determined from the data provided (Choice E) because the rate of pruritus in each group is given, which allows for the calculation of ARR. NNT is then calculated as 1/ARR.

Educational Objective: The number needed to treat is the number of individuals who need to receive an intervention to prevent one negative outcome. The number needed to treat is the inverse of the absolute risk reduction.

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40. State health officials are planning to implement a new skin cancer screening program in agricultural workers in several southern states who are occupationally exposed to the sun. The screening program will consist of annual visual skin examinations. Some researchers are concerned about the limited effectiveness of the program. Which of the following is most likely to cause overestimation of the effectiveness of this screening program?

A) Confounding by geographic location
B) Healthy worker effect
C) Length bias
D) Random error

Correct Answer: C.

Length bias is a form of selection bias which causes overestimation of the effectiveness of a cancer screening program. This occurs when slow-growing cancers that have a long asymptomatic phase are preferentially detected earlier in their course by the screening. Slow-growing cancers have a longer asymptomatic phase and thus a larger window during which screening will identify asymptomatic disease. In contrast, fast-growing cancers have a shorter asymptomatic phase because they cause symptoms sooner that cause patients to seek medical care. Based on the length of their asymptomatic window, slow-growing cancers are more likely to be found with screening. Cancers that grow slowly are less likely to cause death than cancers that grow rapidly, so if the screening program preferentially identifies slow-growing cancers, then the overall survival of patients will be overestimated and will not reflect cases of rapidly growing cancer that caused death. When length bias is present, it may appear that overall survival is improved, when the cause of the improved outcome is actually that the slow-growing tumors inherently have a survival advantage over fast-growing tumors and are overrepresented in the sample population. Length bias may give the impression that survival has increased as a result of screening, but in fact, the natural history of the disease process has not changed. Less fatal tumors have just been preferentially identified.

Incorrect Answers: A, B, and D.

Confounding by geographic location (Choice A) will not likely influence the effectiveness of the screening program. If the screening program is used to develop programs for other parts of the country, then the relative rate of skin cancer incidence based on geographic location may need to be considered. For example, the rates of skin cancer detection by the program may vary based on geographic location because of differences in ultraviolet radiation intensity.

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Length bias is a form of selection bias which causes overestimation of the effectiveness of a cancer screening program. This occurs when slow-growing cancers that have a long asymptomatic phase are preferentially detected earlier in their course by the screening. Slow-growing cancers have a longer asymptomatic phase and thus a larger window during which screening will identify asymptomatic disease. In contrast, fast-growing cancers have a shorter asymptomatic phase because they cause symptoms sooner that cause patients to seek medical care. Based on the length of their asymptomatic window, slow-growing cancers are more likely to be found with screening. Cancers that grow slowly are less likely to cause death than cancers that grow rapidly, so if the screening program preferentially identifies slow-growing cancers, then the overall survival of patients will be overestimated and will not reflect cases of rapidly growing cancer that caused death. When length bias is present, it may appear that overall survival is improved, when the cause of the improved outcome is actually that the slow-growing tumors inherently have a survival advantage over fast-growing tumors and are overrepresented in the sample population. Length bias may give the impression that survival has increased as a result of screening, but in fact, the natural history of the disease process has not changed. Less fatal tumors have just been preferentially identified.

Incorrect Answers: A, B, and D.

Confounding by geographic location (Choice A) will not likely influence the effectiveness of the screening program. If the screening program is used to develop programs for other parts of the country, then the relative rate of skin cancer incidence based on geographic location may need to be considered. For example, the rates of skin cancer detection by the program may vary based on geographic location because of differences in ultraviolet radiation intensity.

Healthy worker effect (Choice B) is another form of selection bias in which subjects participating in a study or screening are systematically healthier than the target population to which the findings will be applied. A population of agricultural workers is likely to be more physically active and possibly healthier than the general population. This may make the results of the screening program less relevant to the general population. However, it would not necessarily overestimate the effectiveness of the program.

Random error (Choice D) is an error that causes measurements to vary slightly from each other. Random error must be taken into consideration when a value is being measured for the sake of a study. However, it is not relevant to the effectiveness of this skin cancer screening program.

Educational Objective: When conducting an investigation or introducing a new screening program, there are many potential biases that could impact the results and lead the investigators to overestimate the effectiveness of the program. One such bias is length bias, in which preferential detection of slowly progressive disease over rapidly progressive disease overestimates survival.

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41. A study is conducted to assess the efficacy of a new drug for the treatment of hypertension. A total of 6000 patients are enrolled in the study; 50% of the patients receive the new drug and 50% receive standard antihypertensive therapy. The goal is to confirm efficacy and assess for adverse effects. The study builds on other studies done previously to assess safe dosing range, drug administration protocol, and initial efficacy. Which of the following best describes the phase of this clinical trial?

A) 0
B) 1
C) 2
D) 3
E) 4

Correct Answer: D.

The study described is an example of a phase 3 clinical trial. A randomized clinical trial is an experimental study conducted in humans. Patients are allocated to two or more interventional arms or control arms, and these patients are followed over time to evaluate an outcome of interest. Study design improves when the study is randomized (participants are randomly assigned to each group), controlled (participants in each group are similar to each other), and double-blinded (neither participants nor investigators know which group a participant is assigned to). There are four types of clinical trials, which are denoted by phases: phase 1, 2, 3, and 4. In a phase 3 clinical trial, a large number of patients with the disease being studied are randomized to receive either the new drug or current standard of care, which may be a placebo. The purpose of the phase 3 clinical trial is to determine whether the drug under investigation is better than the current standard of care, or placebo, for the condition being studied.

Incorrect Answers: A, B, C, and E.

There is no phase 0 (Choice A) designation in the classification of clinical trials. Phase 0 could colloquially imply that the intervention is being studied *in vitro* in preparation for human studies, but it is not an accepted classification of clinical trials.

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Correct Answer: D.

The study described is an example of a phase 3 clinical trial. A randomized clinical trial is an experimental study conducted in humans. Patients are allocated to two or more interventional arms or control arms, and these patients are followed over time to evaluate an outcome of interest. Study design improves when the study is randomized (participants are randomly assigned to each group), controlled (participants in each group are similar to each other), and double-blinded (neither participants nor investigators know which group a participant is assigned to). There are four types of clinical trials, which are denoted by phases: phase 1, 2, 3, and 4. In a phase 3 clinical trial, a large number of patients with the disease being studied are randomized to receive either the new drug or current standard of care, which may be a placebo. The purpose of the phase 3 clinical trial is to determine whether the drug under investigation is better than the current standard of care, or placebo, for the condition being studied.

Incorrect Answers: A, B, C, and E.

There is no phase 0 (Choice A) designation in the classification of clinical trials. Phase 0 could colloquially imply that the intervention is being studied *in vitro* in preparation for human studies, but it is not an accepted classification of clinical trials.

The described clinical trial is a phase 3 clinical trial, not phase 1 (Choice B). In phase 1 clinical trials, a small group of healthy individuals are given a new therapy to determine if the intervention is safe in healthy individuals. The safety, toxicity, and pharmacologic properties of a drug are determined in a phase 1 clinical trial.

Phase 2 (Choice C) clinical trials are conducted in a small group of participants who have the disease being studied to determine whether the intervention is effective. The correct dosing of the medication and whether it causes any adverse effects are also evaluated in a phase 2 clinical trial.

Phase 4 (Choice E) clinical trials refer to the postmarketing surveillance period after a new drug has been approved for use in humans. The purpose of phase 4 clinical trials is to determine the long-term safety profile of the medication. A phase 4 clinical trial may also identify rare adverse effects that were not identified in prior clinical trials because of the restricted sample size. The results of a phase 4 clinical trial may result in a medication being removed from the market.

Educational Objective: A randomized clinical trial is an experimental study conducted in humans. There are four types of clinical trials: phase 1, 2, 3, and 4. A phase 3 clinical trial compares the efficacy of the new intervention to the current standard of care or placebo in a large number of patients. The validity of the trial improves when it is randomized, controlled, and double-blinded.

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42. A 67-year-old man comes to the physician because of easy fatigability and generalized weakness for 3 months and left chest pain for 1 month. The chest pain is worse on deep inspiration. He appears slightly pale. There is tenderness over the left 8th and 9th ribs laterally. Examination shows no other abnormalities. His hematocrit is 28%. Serum and urine protein electrophoresis shows a monoclonal spike. A biopsy specimen of bone marrow shows greater than 50% plasma cells. An x-ray of the chest shows 1- to 1.5-cm areas of radiolucency in both ribs corresponding to the sites of tenderness. This patient's condition makes him most susceptible to infection with which of the following organisms?

A) *Aspergillus fumigatus*
B) *Escherichia coli*
C) Herpes zoster virus
D) *Mycobacterium tuberculosis*
E) *Pneumocystis jirovecii*
F) *Streptococcus pneumoniae*

Correct Answer: F.

This patient's presenting findings of fatigue, weakness, lytic bone lesions (including of the ribs), monoclonal gammopathy, and anemia are consistent with a diagnosis of multiple myeloma. Multiple myeloma is a malignancy caused by the neoplastic proliferation of plasma cells. Neoplastic plasma cells overproduce monoclonal immunoglobulin and light or heavy chains, which may result in acute renal failure. Patients also commonly present with constitutional symptoms of fatigue and weight loss, hepatosplenomegaly, hypercalcemia, kidney stones, or opportunistic infections secondary to immune dysfunction. Opportunistic infection is one of the most common causes of death in patients with multiple myeloma during the first several months following diagnosis. Patients with multiple myeloma are particularly vulnerable to infection with encapsulated organisms, including *Streptococcus pneumoniae, Haemophilus influenzae, Escherichia coli, Neisseria meningitidis, Salmonella typhi, Klebsiella pneumoniae*, and group B *Streptococcus*. Gram-positive infections with *Streptococcus pneumoniae* are most commonly implicated.

Incorrect Answers: A, B, C, D, and E.

Aspergillus fumigatus (Choice A) is a mold that is rarely implicated as an opportunistic pathogen in patients with multiple myeloma. Infection with *S. pneumoniae* is much

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immunoglobulin and light or heavy chains, which may result in acute renal failure. Patients also commonly present with constitutional symptoms of fatigue and weight loss, hepatosplenomegaly, hypercalcemia, kidney stones, or opportunistic infections secondary to immune dysfunction. Opportunistic infection is one of the most common causes of death in patients with multiple myeloma during the first several months following diagnosis. Patients with multiple myeloma are particularly vulnerable to infection with encapsulated organisms, including *Streptococcus pneumoniae, Haemophilus influenzae, Escherichia coli, Neisseria meningitidis, Salmonella typhi, Klebsiella pneumoniae*, and group B *Streptococcus*. Gram-positive infections with *Streptococcus pneumoniae* are most commonly implicated.

Incorrect Answers: A, B, C, D, and E.

Aspergillus fumigatus (Choice A) is a mold that is rarely implicated as an opportunistic pathogen in patients with multiple myeloma. Infection with *S. pneumoniae* is much more common.

Escherichia coli (Choice B) is responsible for a substantial portion of opportunistic infections in patients with multiple myeloma. However, infection with *E. coli* is not as common as infection with *S. pneumoniae*.

Herpes zoster virus (Choice C) is a common cause of shingles in elderly adults, which may lead to severe pleuritic pain if it affects a dermatome overlying the ribs. Shingles is typically accompanied by a dermatomal rash. Patients with multiple myeloma who have not begun treatment are not at increased risk for shingles in comparison with the general population. However, most patients with multiple myeloma are treated with proteasome inhibitors, including bortezomib, which are known to increase the risk for reactivation of latent herpes zoster infection.

Mycobacterium tuberculosis (Choice D) causes primary or disseminated tuberculosis, which is common in endemic areas and in persons living in close quarters. The immune response to tuberculosis, while involving several cell types, primarily relates to granuloma formation which is a function of macrophages and T lymphocytes. It is not the most common pathogen affecting patients with multiple myeloma.

Pneumocystis jirovecii (Choice E) is a common opportunistic cause of pneumonia in patients with late-stage HIV and AIDS.

Educational Objective: Multiple myeloma presents with a constellation of signs and symptoms, including lytic bone lesions, bone pain, renal failure, hypercalcemia, and opportunistic infection. Patients with multiple myeloma are particularly vulnerable to infection with encapsulated organisms, including *Streptococcus pneumoniae, Haemophilus influenzae, Neisseria meningitidis, Salmonella typhi, Klebsiella pneumoniae*, and group B *Streptococcus*.

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43. A previously healthy 18-year-old primigravid African American woman at 18 weeks' gestation is brought to the emergency department because of a 2-day history of fever and a 12-hour history of severe left-sided back pain. She has had no prenatal care. Her family history is unknown because she was adopted. Her temperature is 39.1°C (102.4°F), pulse is 110/min, and blood pressure is 100/62 mm Hg. Examination shows left costovertebral angle tenderness. The uterus is consistent in size with an 18-week gestation. Laboratory studies show:

Hemoglobin	7.9 g/dL
Hemoglobin electrophoresis	
Hemoglobin A_1	14%
Hemoglobin A_2	4%
Hemoglobin F	7%
Hemoglobin S	75%
Mean corpuscular volume	90 μm^3
Platelet count	159,000/mm^3
Urine	
Bacteria	3+
WBCs	3+

In addition to antibiotic treatment, which of the following is the most appropriate pharmacotherapy?

A) Erythropoietin
B) Folic acid
C) Iron
D) Vitamin B_{12} (cyanocobalamin)
E) Vitamin C

Correct Answer: B.

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D) Vitamin B_{12} (cyanocobalamin)

E) Vitamin C

Correct Answer: B.

Folic acid supplementation should be provided to this pregnant patient with sickle cell disease. Her presentation with fever, costovertebral angle tenderness, bacteriuria, and pyuria is consistent with a diagnosis of pyelonephritis, and she should be treated promptly with antibiotics. Given that this patient is now through the first trimester, the addition of folic acid will not provide any benefit in decreasing the likelihood of neural tube defects. However, folic acid should be given to all patients with sickle cell disease since it is required for hematopoiesis. Given this patient's low hemoglobin concentration and acute infection, it is likely that she has a higher degree of sickling than normal, and this is often accompanied by a robust hematopoiesis. Folic acid should be continued through the end of this patient's pregnancy but may also be continued indefinitely.

Incorrect Answers: A, C, D, and E.

Erythropoietin (Choice A) is indicated for the treatment of anemia that is secondary to end-stage kidney disease, not for patients with sickle cell disease.

Iron (Choice C) supplementation is frequently recommended to pregnant women, but this patient does not have any laboratory evidence to support iron deficiency anemia such as a low iron saturation concentration and increased total-iron binding capacity. Her anemia is secondary to sickle cell disease.

Vitamin B_{12} (cyanocobalamin) (Choice D) supplementation is indicated for patients with megaloblastic anemia, which presents with macrocytosis and sometimes with neurologic complications such as subacute combined degeneration of the spinal cord.

Vitamin C (Choice E) supplementation is not routinely recommended but is used to treat patients with scurvy, which presents with corkscrew hairs, bruising, and mucocutaneous bleeding.

Educational Objective: Patients with sickle cell disease, and especially those who are pregnant and/or suffering from acute illness that increases the risk for sickling, should be treated with folic acid supplementation. Folate is required for the production of erythrocytes and may become deficient in patients with sickle cell disease who are undergoing robust hematopoiesis.

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44. A 23-year-old man with schizophrenia is brought to the emergency department by his mother 28 hours after the onset of progressive confusion and agitation. He has had increased thirst during this period. One week ago, he was discharged after treatment for the second exacerbation of schizophrenia. Current medications include haloperidol and benztropine. He appears flushed. His temperature is 38°C (100.4°F), pulse is 100/min, and blood pressure is 160/90 mm Hg. Examination shows dry mucous membranes. Pupils are 4 mm and reactive to light. On mental status examination, he is not oriented to person, place, or time. Which of the following is the most likely explanation for these findings?

A) Anticholinergic delirium
B) Exacerbation of schizophrenia
C) Neuroleptic malignant syndrome
D) Oxycodone overdose
E) PCP (phencyclidine) intoxication

Correct Answer: A.

Benztropine, which antagonizes muscarinic acetylcholine receptors, is commonly co-administered with typical antipsychotic medications such as haloperidol to prevent extrapyramidal symptoms (secondary to modulating the acetylcholine-dopamine balance in the basal ganglia). Endogenous acetylcholine binding to muscarinic receptors causes smooth muscle contraction of the sweat glands, salivary glands, airways, bladder, and bowel. Cholinergic neurons projecting to the cerebral cortex mediate attention, learning, and memory. Antagonism of muscarinic acetylcholine receptors blocks cholinergic signaling in the brain and causes the dysfunction of smooth muscle contraction, leading to cognitive impairment, disorientation, delirium, sedation, mydriasis, anhidrosis (leading to mild hyperthermia and flushed skin in this patient), dry mouth, urinary retention, and/or constipation. Management of severe cases of anticholinergic excess involves benzodiazepines or physostigmine, though generally supportive care is sufficient.

Incorrect Answers: B, C, D, and E.

An exacerbation of schizophrenia (Choice B) typically presents with an increased intensity of hallucinations, delusions, or disorganized thinking/behavior. Patients are typically fully oriented to person, place, and time and do not usually demonstrate significant vital sign or physical examination abnormalities.

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extrapyramidal symptoms (secondary to modulating the acetylcholine-dopamine balance in the basal ganglia). Endogenous acetylcholine binding to muscarinic receptors causes smooth muscle contraction of the sweat glands, salivary glands, airways, bladder, and bowel. Cholinergic neurons projecting to the cerebral cortex mediate attention, learning, and memory. Antagonism of muscarinic acetylcholine receptors blocks cholinergic signaling in the brain and causes the dysfunction of smooth muscle contraction, leading to cognitive impairment, disorientation, delirium, sedation, mydriasis, anhidrosis (leading to mild hyperthermia and flushed skin in this patient), dry mouth, urinary retention, and/or constipation. Management of severe cases of anticholinergic excess involves benzodiazepines or physostigmine, though generally supportive care is sufficient.

Incorrect Answers: B, C, D, and E.

An exacerbation of schizophrenia (Choice B) typically presents with an increased intensity of hallucinations, delusions, or disorganized thinking/behavior. Patients are typically fully oriented to person, place, and time and do not usually demonstrate significant vital sign or physical examination abnormalities.

Neuroleptic malignant syndrome (NMS) (Choice C) is a life-threatening condition associated with the antagonism of dopamine that presents with altered mental status, muscle rigidity, hyperthermia, and autonomic dysfunction (leading to severe vital sign derangements rather than this patient's mild derangements). Dry mouth and flushed skin would be atypical. As well, this patient did not demonstrate muscle rigidity consistent with NMS.

Oxycodone overdose (Choice D) agonizes central opioid receptors, causing symptoms of central nervous system depression including sedation, respiratory depression, bradycardia, and hypotension. Miosis differentiates opioid intoxication from other toxidromes, including anticholinergic toxicity. As well, agitation, tachycardia, dry mouth, and flushed skin are more consistent with anticholinergic toxicity.

PCP (phencyclidine) (Choice E) is an *N*-methyl-D-aspartate glutamatergic receptor antagonist that is used recreationally for its euphoria-inducing and dissociative effects. PCP intoxication is often characterized by signs and symptoms including hyperthermia, hypertension, tachycardia, erratic behavior, paranoia, psychosis, aggression, decreased sensation, ataxia, nystagmus, myoclonus, and dysarthria. This patient demonstrates confusion rather than psychosis or aggression. As well, dry mouth and flushed skin would be uncommon.

Educational Objective: Anticholinergic medications such as benztropine are commonly co-administered with antipsychotic medications to prevent extrapyramidal adverse effects. Anticholinergic medications can lead to sedation and delirium along with adverse effects related to the blockade of smooth muscle contraction, such as anhidrosis, dry mouth, urinary retention, and/or constipation.

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45. A 24-year-old man comes to the clinic because of a 2-day history of severe mouth pain, fever, sore throat, and malaise. He has no known sick contacts. He has no history of serious illness and takes no medications. He recently returned home from active duty deployment in the US Air Force. His temperature is 38.7°C (101.7°F). Examination shows cervical lymphadenopathy. There are multiple small vesicles over the inside of the mouth and posterior oropharynx. Soft tissue fullness is noted. Which of the following is the most appropriate next step in diagnosis?

A) Biopsy of an oral vesicle
B) Monospot test
C) Polymerase chain reaction test of an open vesicle
D) Swab and culture of the posterior oropharynx
E) Wet mount preparation of oral cavity scrapings with KOH

Correct Answer: C.

Polymerase chain reaction (PCR) of the posterior oropharynx to test for the presence of herpes simplex virus 1 or 2 (HSV-1 or HSV-2) is indicated in this patient with cervical lymphadenopathy and a vesicular eruption of the posterior oropharynx and mouth. This presentation is consistent with primary herpes simplex infection. Severe oral and pharyngeal involvement can cause unrelenting pain and dehydration secondary to odynophagia, so patients should be evaluated for evidence of hypovolemia. Traditional methods of diagnosing HSV infection include viral culture, which is slow and arduous, and a Tzanck smear, which requires staining cells from unroofed vesicles with Giemsa stain and examining them under a microscope. However, the preferred method of testing for HSV infection in current clinical practice is to use a PCR-based test, which is rapid and can easily differentiate between the varicella-zoster, HSV-1, and HSV-2 viruses. Treatment for oral herpes infection includes acyclovir or valacyclovir for 7 to 10 days if patients present within 72 hours of symptom onset. These medications inhibit viral DNA polymerase and halt reproduction of the virus. Patients should be cautioned that they remain infectious while sores remain open and draining.

Incorrect Answer: A, B, D, and E.

Biopsy of an oral vesicle (Choice A) is usually not required since a diagnosis of HSV infection can be made with PCR. Swabs of vesicular lesions are also noninvasive. Biopsy is indicated if there is concern that a lesion may be malignant.

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E) Wet mount preparation of oral cavity scrapings with KOH

Correct Answer: C.

Polymerase chain reaction (PCR) of the posterior oropharynx to test for the presence of herpes simplex virus 1 or 2 (HSV-1 or HSV-2) is indicated in this patient with cervical lymphadenopathy and a vesicular eruption of the posterior oropharynx and mouth. This presentation is consistent with primary herpes simplex infection. Severe oral and pharyngeal involvement can cause unrelenting pain and dehydration secondary to odynophagia, so patients should be evaluated for evidence of hypovolemia. Traditional methods of diagnosing HSV infection include viral culture, which is slow and arduous, and a Tzanck smear, which requires staining cells from unroofed vesicles with Giemsa stain and examining them under a microscope. However, the preferred method of testing for HSV infection in current clinical practice is to use a PCR-based test, which is rapid and can easily differentiate between the varicella-zoster, HSV-1, and HSV-2 viruses. Treatment for oral herpes infection includes acyclovir or valacyclovir for 7 to 10 days if patients present within 72 hours of symptom onset. These medications inhibit viral DNA polymerase and halt reproduction of the virus. Patients should be cautioned that they remain infectious while sores remain open and draining.

Incorrect Answer: A, B, D, and E.

Biopsy of an oral vesicle (Choice A) is usually not required since a diagnosis of HSV infection can be made with PCR. Swabs of vesicular lesions are also noninvasive. Biopsy is indicated if there is concern that a lesion may be malignant.

Monospot test (Choice B) is a blood test that assesses the presence of a heterophile antibody. A positive test indicates primary infection with Epstein-Barr virus, which causes a viral syndrome of malaise and pharyngitis known as mononucleosis.

Swab and culture of the posterior oropharynx (Choice D) is not necessary. Viral cultures are tedious, difficult to perform, and slower than PCR-based testing.

Wet mount preparation of oral cavity scrapings with KOH (Choice E) is used to diagnose fungal or yeast infections. Oral candidiasis can usually be diagnosed clinically as areas of white exudate with an underlying erythematous base and does not often require a wet mount preparation.

Educational Objective: Primary HSV infection frequently presents with oral gingivostomatitis. Physical examination will demonstrate intact or unroofed vesicles within the oropharynx that are extremely painful and have an erythematous base. Diagnosis is usually confirmed by sampling an unroofed vesicle and assessing for the presence of HSV using PCR. Treatment is with oral acyclovir or valacyclovir.

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46. A 4-year-old girl is brought to the physician because of a 3-month history of episodic abdominal pain and loose stools that recur several times weekly. She has not had nausea, vomiting, or decreased appetite. Her development has been appropriate for age. She received the diagnosis of type 1 diabetes mellitus 9 months ago, and her most recent hemoglobin A_{1c} was 7.5%. Her only medication is insulin. She appears well. She is at the 25th percentile for height and 10th percentile for weight, as she was at her last examination 4 months ago. Her temperature is 36.7°C (98°F), pulse is 100/min, respirations are 24/min, and blood pressure is 95/60 mm Hg. The conjunctivae are pale. A grade 1/6, systolic ejection murmur is heard at the left sternal border. The abdomen is mildly distended but soft and nontender; there is no hepatosplenomegaly. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hemoglobin	10 g/dL
Mean corpuscular volume	67 μm^3 (N=70–74)
Leukocyte count	8500/mm^3
Platelet count	250,000/mm^3
Red cell distribution width	18% (N=13%–15%)

Additional serum studies are most likely to show an increase in which of the following?

A) α_1-Antitrypsin concentration
B) Ferritin concentration
C) Folic acid concentration
D) Tissue transglutaminase IgA antibodies
E) Total bilirubin concentration

Correct Answer: D.

This child with a history of autoimmune disease and who presents with chronic diarrhea, microcytic anemia, and an increased red cell distribution width likely has iron deficiency anemia, which may occur secondary to malabsorption in the setting of celiac disease. Celiac disease is a gluten-sensitive enteropathy that is mediated through immune intolerance of the protein gliadin, commonly found in wheat products. This results in inflammatory infiltration of the proximal small bowel, which leads to

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Platelet count	250,000/mm^3
Red cell distribution width	18% (N=13%–15%)

Additional serum studies are most likely to show an increase in which of the following?

A) α_1-Antitrypsin concentration
B) Ferritin concentration
C) Folic acid concentration
D) Tissue transglutaminase IgA antibodies
E) Total bilirubin concentration

Correct Answer: D.

This child with a history of autoimmune disease and who presents with chronic diarrhea, microcytic anemia, and an increased red cell distribution width likely has iron deficiency anemia, which may occur secondary to malabsorption in the setting of celiac disease. Celiac disease is a gluten-sensitive enteropathy that is mediated through immune intolerance of the protein gliadin, commonly found in wheat products. This results in inflammatory infiltration of the proximal small bowel, which leads to characteristic intraepithelial lymphocytosis, villous atrophy, and crypt hyperplasia. Malabsorption of substances in the proximal small bowel ensues, which presents symptomatically as chronic diarrhea, steatorrhea, and nutritional deficiencies. Patients with celiac disease may develop iron deficiency anemia, which may be present on laboratory evaluation with decreased hematocrit and microcytosis. In children, the introduction of gluten into the diet quickly leads to the development of symptoms which may occur as early as 2 years of age and may lead to decreased growth and nutritional deficiency if untreated. The majority of children with significant villous atrophy will develop iron deficiency anemia. The presence of unexplained iron deficiency anemia, particularly in the setting of other autoimmune disease, should prompt an evaluation for celiac disease. The diagnosis of celiac disease can be confirmed by the detection of serum anti-transglutaminase antibodies or by small bowel biopsy demonstrating villous atrophy along with intraepithelial lymphocytes and crypt hyperplasia. Treatment includes avoidance of gluten-containing foods and reversal of any acquired nutritional deficiencies.

Incorrect Answers: A, B, C, and E.

α_1-Antitrypsin concentration (Choice A) is useful for the diagnosis of α_1-antitrypsin deficiency, which leads to the early development of panacinar emphysema and

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This child with a history of autoimmune disease and who presents with chronic diarrhea, microcytic anemia, and an increased red cell distribution width likely has iron deficiency anemia, which may occur secondary to malabsorption in the setting of celiac disease. Celiac disease is a gluten-sensitive enteropathy that is mediated through immune intolerance of the protein gliadin, commonly found in wheat products. This results in inflammatory infiltration of the proximal small bowel, which leads to characteristic intraepithelial lymphocytosis, villous atrophy, and crypt hyperplasia. Malabsorption of substances in the proximal small bowel ensues, which presents symptomatically as chronic diarrhea, steatorrhea, and nutritional deficiencies. Patients with celiac disease may develop iron deficiency anemia, which may be present on laboratory evaluation with decreased hematocrit and microcytosis. In children, the introduction of gluten into the diet quickly leads to the development of symptoms which may occur as early as 2 years of age and may lead to decreased growth and nutritional deficiency if untreated. The majority of children with significant villous atrophy will develop iron deficiency anemia. The presence of unexplained iron deficiency anemia, particularly in the setting of other autoimmune disease, should prompt an evaluation for celiac disease. The diagnosis of celiac disease can be confirmed by the detection of serum anti-transglutaminase antibodies or by small bowel biopsy demonstrating villous atrophy along with intraepithelial lymphocytes and crypt hyperplasia. Treatment includes avoidance of gluten-containing foods and reversal of any acquired nutritional deficiencies.

Incorrect Answers: A, B, C, and E.

α_1-Antitrypsin concentration (Choice A) is useful for the diagnosis of α_1-antitrypsin deficiency, which leads to the early development of panacinar emphysema and cirrhosis.

Ferritin concentration (Choice B) is useful as part of the evaluation of iron deficiency but does not help detect the underlying cause of this patient's iron deficiency and malabsorption.

Folic acid concentration (Choice C), when low, typically presents with a macrocytic, rather than a microcytic anemia. Dietary sources of folate include leafy vegetables and legumes.

Total bilirubin concentration (Choice E) is useful for the diagnosis of hemolytic anemia, which typically presents with jaundice.

Educational Objective: Celiac disease may occur in children as soon as gluten is introduced into the diet. The majority of children with significant villous atrophy will develop iron deficiency anemia. The presence of unexplained iron deficiency anemia, particularly in the setting of other autoimmune disease, should prompt an evaluation for celiac disease.

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47. A 42-year-old woman, gravida 5, para 4, at 14 weeks' gestation comes to the physician for a routine prenatal visit. Prior to conception, menses had occurred at regular 28-day intervals. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. Examination shows a closed cervix and a uterus consistent in size with a 6-week gestation. Ultrasonography shows a normal uterus with a gestational sac and no cardiac activity. Which of the following is the most likely diagnosis?

A) Blighted ovum
B) Ectopic pregnancy
C) Gestational trophoblastic disease
D) Pituitary adenoma
E) Septic abortion
F) Uterine didelphys

Correct Answer: A.

A blighted ovum is an anembryonic pregnancy in which a fertilized egg attaches to the uterine wall, but the embryo fails to develop or is resorbed by the uterus, leaving an empty gestational sac. This commonly occurs early in pregnancy, so symptoms are often those seen in early pregnancy: a missed menstrual period, nausea, breast tenderness, and vaginal spotting. Ultrasonography will demonstrate the gestational sac without cardiac activity, as in this patient. It is usually caused by significant fetal chromosomal abnormalities. Management is supportive, since the mother will often pass the remaining gestational tissue without intervention. However, some women will elect to have dilation and curettage which may permit genetic analysis of the remaining tissue.

Incorrect Answers: B, C, D, E, and F.

Ectopic pregnancy (Choice B) presents with vaginal bleeding and abdominal pain as a result of the abnormal implantation of an embryo outside of the uterine cavity, most commonly in the fallopian tube. It can also present with hemodynamic instability and hemoperitoneum in the setting of rupture. Ultrasonography would not disclose a pregnancy within the uterus but may show a pseudogestational sac during an ectopic pregnancy.

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Gestational trophoblastic disease (Choice C) describes trophoblast-derived tumors, which can be benign or malignant. Examples include hydatidiform moles, invasive moles, and choriocarcinoma. It presents with uterine size and concentrations of human chorionic gonadotropin out of proportion to dates, in addition to bilateral ovarian theca lutein cysts and abnormal echogenicity in the uterus on ultrasonography.

Pituitary adenomas (Choice D) can be inactive, inhibit proper production of hormones leading to hypopituitarism, or secrete hormones such as prolactin, follicle-stimulating hormone, luteinizing hormone, or adrenocorticotropic hormone. They can be asymptomatic or present with symptoms caused by their hormonal actions, in addition to headache and visual changes in the setting of macroadenomas. A pituitary adenoma would not cause a miscarriage with an empty gestational sac in an otherwise healthy patient.

Septic abortions (Choice E) are severe infections of the placenta, uterus, or products of conception before or after an abortion. While it can be caused by an ascending infection, it can also be caused by the surgical removal of products of conception in the setting of contaminated instruments. It presents with fever, tachycardia, and leukocytosis but can progress to cause septic shock if not treated. It is less likely in this otherwise well-appearing patient.

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chromosomal abnormalities. Management is supportive, since the mother will often pass the remaining gestational tissue without intervention. However, some women will elect to have dilation and curettage which may permit genetic analysis of the remaining tissue.

Incorrect Answers: B, C, D, E, and F.

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Uterine didelphys (Choice F) is an anatomic abnormality caused by failure of the Müllerian ducts to fuse, leading to a double uterus, each with one fallopian tube and one cervical opening. There may also be a double vagina. While this can cause recurrent miscarriages, it would be evident on ultrasonography.

Educational Objective: A blighted ovum occurs when a fertilized egg implants into the endometrial lining, but an embryo fails to develop, often because of severe fetal chromosomal abnormalities. On ultrasonography, an empty gestational sac without fetal cardiac activity will be seen. Management is supportive, since the remaining gestational tissue is often passed without intervention.

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48. A 77-year-old man is brought to the physician by his wife because of a 1-year history of poor balance, weakness of his legs, and numbness of his toes and feet. His wife states that he is not as mentally sharp as he was 1 year ago. He has peptic ulcer disease and hypertension. Current medications are hydrochlorothiazide and ranitidine. His blood pressure is 148/88 mm Hg. Examination shows normal muscle tone and strength in the upper and lower extremities. Deep tendon reflexes are 2+ in the upper extremities, 3+ at the knees, and absent at the ankles. Babinski sign is present. Proprioception and sensation to vibration are markedly decreased at the ankles and toes. He has a broad-based but steady gait. On mental status examination, he is oriented to month, day, and year. He can name the current president but none of the previous presidents. Mean corpuscular volume is 105 μm^3, and serum lactate dehydrogenase activity is 210 U/L. A serologic test for syphilis is negative. MRI of the brain shows mild cortical atrophy, enlarged ventricles, and multiple small areas of T2 hyperintensities in the white matter. Which of the following is the most likely diagnosis?

A) Amyotrophic lateral sclerosis
B) Dementia, Alzheimer type
C) Multi-infarct (vascular) dementia
D) Normal-pressure hydrocephalus
E) Vitamin B_{12} (cobalamin) deficiency

Correct Answer: E.

Vitamin B_{12}, or cobalamin, is a water-soluble B vitamin that is essential for the proper health of neural and hematopoietic tissue. Dietary sources of vitamin B_{12} primarily include animal sources, such as meat, milk, or eggs. Vitamin B_{12} deficiency is rarely a result of dietary deficiency, except in cases of strict veganism, and is more commonly encountered because of gastrointestinal malabsorption due to causes such as pernicious anemia, malabsorption caused by bariatric surgery, celiac or Crohn disease, bacterial small bowel overgrowth, or infection with the fish tapeworm *Diphyllobothrium latum*. Vitamin B_{12} deficiency presents with macrocytic anemia and associated, generalized symptoms of fatigue, pallor, and light-headedness. Vitamin B_{12} deficiency may be distinguished from vitamin B_9, or folate, deficiency by the presence of neuropsychiatric symptoms, specifically subacute combined degeneration. Subacute combined degeneration is caused by demyelination of the dorsal columns, lateral corticospinal tracts, and spinocerebellar tracts, and presents with ataxic gait, muscle weakness, paresthesia, abnormal deep tendon reflexes, and loss of proprioception and vibration sense.

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Incorrect Answers: A, B, C, and D.

Amyotrophic lateral sclerosis (Choice A) is a progressive neurodegenerative disorder arising in midlife that affects both upper and lower motor neurons of the lateral corticospinal tract within the brain and spinal cord. Patients present with a combination of upper motor neuron (eg, increased muscle tone, hyperreflexia, Babinski sign) and lower motor neuron findings (eg, decreased muscle tone, hyporeflexia, early muscle atrophy) in an asymmetric distribution that may include the bulbar muscles.

Dementia, Alzheimer type (Choice B) may cause cognitive dysfunction in elderly patients but does not typically present with peripheral neuropathy or macrocytic anemia. Treatable and potentially reversible causes must always be considered and excluded in elderly patients with cognitive dysfunction.

Multi-infarct (vascular) dementia (Choice C) presents with stepwise cognitive decline and focal neurologic deficits. While this patient displays radiographic evidence of microvascular disease, his lack of stepwise decline, his peripheral neuropathy, and his macrocytic anemia are more suggestive of vitamin B_{12} deficiency.

Normal-pressure hydrocephalus (Choice D) is a communicating (nonobstructive) hydrocephalus in which the ventricles are enlarged, leading to damage of the white matter tracts connecting the frontal lobes and basal ganglia, and presents with triad of cognitive impairment, urinary incontinence, and gait instability. Mild enlargement of the ventricles may occur as a result of normal aging and must be distinguished from true ventriculomegaly.

Educational Objective: Vitamin B_{12} deficiency typically occurs because of pernicious anemia, malabsorption, or gastrointestinal infections, It presents with macrocytic anemia and generalized symptoms of fatigue, pallor, and light-headedness and may lead to subacute combined degeneration. Subacute combined degeneration results from demyelination of the dorsal columns, lateral corticospinal tracts, and spinocerebellar tracts, and it presents with ataxic gait, muscle weakness, paresthesia, abnormal deep tendon reflexes, and loss of proprioception and vibration sense.

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49. A 17-year-old boy with intellectual developmental disorder is brought to the physician because of low-grade fever and abdominal pain for 6 days. His temperature is 37.8°C (100.1°F), pulse is 110/min, respirations are 22/min, and blood pressure is 120/70 mm Hg. Examination shows splinter hemorrhages under the nails. A grade 2/6 systolic murmur is heard best at the upper left sternal border. There is a systolic ejection click. S_1 and S_2 are normal. Abdominal examination shows splenomegaly. Laboratory studies show:

Hemoglobin	9.1 g/dL
Leukocyte count	30,000/mm^3
Platelet count	928,000/mm^3
Erythrocyte sedimentation rate	110 mm/h
Urine	
Blood	2+
Protein	1+

Which of the following is the most appropriate next step in management?

A) 24-Hour urine collection for measurement of protein and creatinine concentrations
B) Blood cultures
C) Ultrasonography of the abdomen
D) CT scan of the abdomen
E) Broad-spectrum antibiotic therapy

Correct Answer: B.

Bacterial endocarditis is rare in children and is usually associated with an underlying congenital heart disease, rheumatic heart disease, or central venous catheter use. It involves vegetations that form on the endocardium or valves and can present with fever, hypotension, malaise, new cardiac murmurs, splinter hemorrhages, vegetations seen on echocardiography, or blood cultures growing microorganisms typical of endocarditis. Patients may also develop reactive thrombocytosis and congestive splenomegaly. Septic emboli are a common complication. In this patient who presents with multiple indications of infective endocarditis, blood cultures, followed by the

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Incorrect Answers: A, C, D, and E.

24-Hour urine collection for measurement of protein and creatinine concentrations (Choice A) is incorrect, since this is an appropriate diagnostic evaluation in the setting of glomerulonephropathy. While renal involvement is common in endocarditis, this is a consequence of the spreading infection as opposed to a primary pathology involving the kidney itself.

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E) Broad-spectrum antibiotic therapy

Correct Answer: B.

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Ultrasonography of the abdomen (Choice C) or CT scan of the abdomen (Choice D) is unnecessary. Splenomegaly often occurs in the setting of infective endocarditis or systemic bacterial infection and does not typically require additional imaging. In this patient, obtaining blood cultures is more essential to establishing the diagnosis than the pursuit of abdominal imaging.

Broad-spectrum antibiotic therapy (Choice E) is necessary but should begin after blood cultures are obtained. Patients who are critically ill should have at least one blood culture obtained followed immediately by antibiotics.

Educational Objective: Bacterial endocarditis is rare in children and is usually associated with an underlying congenital heart disease, rheumatic heart disease, or central venous catheter use. In children with underlying heart disease, gram-positive organisms are most common, and include *Staphylococcus aureus* and Viridans group *Streptococci*. Blood cultures should be obtained to establish the diagnosis and guide further antibiotic therapy.

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50. A 42-year-old man is admitted to the hospital because of a 2-day history of fever, chills, cough, and shortness of breath. He currently takes atenolol for hypertension and pravastatin for hyperlipidemia. He has smoked one pack of cigarettes daily for 20 years. He underwent splenectomy at the age of 18 years for injuries sustained in a motorcycle collision. He appears pale and is in moderate distress. His temperature is 40°C (104°F), pulse is 120/min, respirations are 22/min, and blood pressure is 100/60 mm Hg. Crackles and decreased breath sounds are heard over the left lower lung field; there is dullness to percussion. Examination shows no other abnormalities. A Gram stain of sputum shows gram-positive diplococci. Treatment with ceftriaxone is begun. An x-ray of the chest shows an infiltrate and pleural effusion on the left. Thoracentesis is performed. Laboratory studies show:

Pleural fluid	
pH	6.8
Glucose	30 mg/dL
Lactate dehydrogenase	850 U/L

Arterial blood gas analysis on room air:

pH	7.44
Pco_2	32 mm Hg
Po_2	68 mm Hg

A Gram stain of the pleural fluid shows many segmented neutrophils and gram-positive diplococci. Which of the following is the most appropriate next step in management of the pleural effusion?

A) Broaden antibiotic coverage for anaerobic bacteria
B) Broaden antibiotic coverage for mycobacteria
C) Placement of a left chest tube
D) Surgical debridement of the pleural space
E) No specific therapy for the effusion indicated

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Po_2	68 mm Hg

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B) Broaden antibiotic coverage for mycobacteria
C) Placement of a left chest tube
D) Surgical debridement of the pleural space
E) No specific therapy for the effusion indicated

Correct Answer: C.

Streptococcus pneumoniae (a gram-positive diplococcus) is the most common bacterial cause of community-acquired pneumonia and has an increased prevalence in patients with a history of immunocompromise, such as HIV or asplenia, including functional asplenia from sickle cell anemia. Typical signs and symptoms of pneumococcal pneumonia include fever, chills, productive cough, shortness of breath, and pleuritic chest pain. Vitals may show tachycardia, tachypnea, and hypotension, whereas physical examination may demonstrate rhonchi, rales, decreased breath sounds, and increased tactile fremitus. X-rays commonly show lobar pneumonia or less commonly bronchopneumonia. Pneumococcal pneumonia can also be complicated by a parapneumonic pleural effusion, which can subsequently become infected by the pneumococcal bacteria and produce pus, at which point it is referred to as an empyema. An empyema is a complicated, exudative pleural effusion with increased lactate dehydrogenase and decreased pH and glucose concentrations. It can cause worsening dyspnea, hypoxemia, and septic shock. Management includes intravenous antibiotics, thoracentesis, and placement of a chest tube to allow drainage of the purulent material. If these are ineffective in treatment of the empyema, surgical intervention may be warranted.

Incorrect Answer: A, B, D, and E.

Broadening antibiotic coverage for anaerobic bacteria (Choice A) is not necessary, since ceftriaxone provides adequate coverage of *Streptococcus pneumoniae*. If this patient did not have evidence of streptococcal infection in his pleural fluid, adding anaerobic coverage may be appropriate, since anaerobes can also cause empyema. However, this is more likely in patients at risk for aspiration.

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Incorrect Answer: A, B, D, and E.

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Broadening antibiotic coverage for mycobacteria (Choice B) is not necessary. *Mycobacterium tuberculosis* presents with either hilar adenopathy and calcified pulmonary granulomas (primary infection) or apical pulmonary opacities (reactivation) in the setting of fever, night sweats, weight loss, and hemoptysis. Less virulent mycobacterium, such as the *Mycobacterium avium* species, present with variable nonspecific signs, such as cough, fatigue, and dyspnea, and appear similar to tuberculosis on imaging or cause bronchiectatic changes. Additionally, this patient has evidence of gram-positive diplococci in his pleural fluid.

Surgical debridement of the pleural space (Choice D) may be warranted if antibiotics and the placement of a chest tube do not improve the empyema. Occasionally, multiple chest tubes are placed prior to surgery, as these collections of purulent fluid are often loculated and difficult to drain with just one tube.

No specific therapy for the effusion indicated (Choice E) is incorrect, since this patient has evidence of empyema on physical examination, laboratory evaluation, and imaging studies. It is difficult for antibiotics to penetrate an empyema; therefore, chest tube placement is necessary to allow for source control. Failure to do so would greatly increase this patient's mortality.

Educational Objective: *Streptococcus pneumoniae* can cause community-acquired pneumonia in patients who are immunocompromised or asplenic, often presenting with fever, productive cough, shortness of breath, and pleuritic chest pain. It can be complicated by a parapneumonic effusion, which can become infected and form an empyema. Treatment includes intravenous antibiotics and tube thoracostomy for source control if an empyema is present.

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1. A 12-year-old boy is brought to the physician because he is concerned about his growth. He says he is the shortest boy in his class. He is an avid soccer player. He is 140 cm (4 ft 7 in) tall and weighs 35 kg (78 lb); BMI is 18 kg/m^2. He is at the 10th percentile for height and 5th percentile for weight. His father is 175 cm (5 ft 9 in) tall, and his mother is 157 cm (5 ft 2 in) tall. The patient's genital and pubic hair development is Tanner stage 1. X-rays show a bone age of 10 years 6 months (±2 months). Which of the following is the most likely explanation for these findings?

A) Constitutional growth delay
B) Familial short stature
C) Fetal growth restriction
D) Growth hormone deficiency
E) Nutritional deficiency

Correct Answer: A.

Constitutional growth delay is the most common cause of delayed puberty and is considered a variant of normal. Patients typically demonstrate a normal birth weight, but at around 3 to 6 months of age begin demonstrating a slower rate of growth than that of other infants. Over time, the patients' growth rate remains consistent but lags behind that of their peers, which may become particularly evident around the time of puberty. Patients often have a family history of delayed growth but ultimately achieve their target adult height potential. An important feature of constitutional growth delay is the lagging of the bone age behind chronological age, eg, the bone age of this patient is 10 years and 6 months while his chronological age is 12 years. Patients also demonstrate other manifestations of delayed puberty, such as a lack of pubic hair and genital development in male patients or delayed thelarche and primary amenorrhea in female patients.

Incorrect Answers: B, C, D, and E.

Familial short stature (Choice B) occurs in patients who have a low-normal height velocity through childhood and adolescence. It is primarily distinguished from constitutional growth delay by the matching of the chronological age and the bone age. The age of puberty onset is typically unaffected. Patients with familiar short stature will maintain a short stature as adults, unlike patients with constitutional growth delay.

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E) Nutritional deficiency

Correct Answer: A.

Constitutional growth delay is the most common cause of delayed puberty and is considered a variant of normal. Patients typically demonstrate a normal birth weight, but at around 3 to 6 months of age begin demonstrating a slower rate of growth than that of other infants. Over time, the patients' growth rate remains consistent but lags behind that of their peers, which may become particularly evident around the time of puberty. Patients often have a family history of delayed growth but ultimately achieve their target adult height potential. An important feature of constitutional growth delay is the lagging of the bone age behind chronological age, eg, the bone age of this patient is 10 years and 6 months while his chronological age is 12 years. Patients also demonstrate other manifestations of delayed puberty, such as a lack of pubic hair and genital development in male patients or delayed thelarche and primary amenorrhea in female patients.

Incorrect Answers: B, C, D, and E.

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Fetal growth restriction (Choice C) occurs when the growth of a fetus based on sonographic measurements is significantly lower than the expected size for gestational age. Fetal growth restriction is actually associated with childhood obesity rather than continued delayed growth.

Growth hormone deficiency (Choice D) typically presents earlier than 12 years if congenital. Postnatal growth delay, hypoglycemia, and jaundice are often seen in infancy. Growth hormone deficiency may also be acquired secondary to an intracranial tumor or head trauma. However, none of these features are present in this case.

Nutritional deficiency (Choice E) is a cause of central hypogonadism leading to delayed growth and puberty. However, this child's history suggests a healthy, active child, not a malnourished one.

Educational Objective: Constitutional growth delay is the most common cause of delayed puberty and is considered a variant of normal. Growth rates are diminished compared with peers beginning in infancy. Bone age lags behind chronological age, which distinguishes it from familial short stature. Also, in contrast to familial short stature, patients with constitutional growth delay ultimately achieve a normal adult height.

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2. A 10-year-old boy is brought to the office by his mother because of a 7-day history of fever and nasal congestion. He has allergic rhinitis. He has had multiple episodes of otitis media and sinusitis and two episodes of pneumonia. His only routine medication is cetirizine. He appears ill but is in no distress. He is at the 30th percentile for height, 40th percentile for weight, and 35th percentile for BMI. His temperature is 37.8°C (100.0°F), pulse is 80/min, respirations are 14/min, and blood pressure is 110/70 mm Hg. Examination discloses an erythematous posterior pharynx and green nasal secretions. The left tympanic membrane is bulging and immobile with insufflation. No other abnormalities are noted. This patient most likely has a deficiency of which of the following immunoglobulins (Ig)?

A) IgA
B) IgD
C) IgE
D) IgG
E) IgM

Correct Answer: A.

Immunoglobulin (IG) A deficiency is the most likely cause of this patient's symptoms. Selective IgA deficiency describes an absence of IgA with normal concentrations of IgG, and normal or increased concentrations of IgM. IgA is critical for immune health and functions in two primary ways. First, IgA binds pathogen surface antigens, targeting them for opsonization, complement activation, and phagocytosis. Second, IgA coats mucosal surfaces and prevents colonization, adhesion, and invasion by pathogenic microorganisms. Immunoglobulins are produced by plasma cells, which are terminally differentiated B lymphocytes; as a result, most causal deficiencies are hypothesized to be related to B lymphocyte abnormalities. Despite this, there is clinical heterogeneity in the severity of IgA deficiency. Some patients remain asymptomatic while others suffer from recurrent sinopulmonary infections. Anaphylactic reactions to blood products such as plasma (which contains donor immunoglobulin) are classic but uncommon, since not all patients with IgA deficiency have reactions to blood products. Such severe reactions are most common in patients with undetectable concentrations of IgA; these reactions occur because of the presence of preformed antibodies against IgA, which in these patients is a non-native protein and thus a target of immune activation.

Incorrect Answers: B, C, D, and E.

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E) IgM

Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

IgD (Choice B) deficiency likely has little to no clinical significance. Hyperimmunoglobulin D syndrome on the other hand presents with recurrent fevers, abdominal pain, and lymphadenopathy.

IgE (Choice C) deficiency increases the risk for bacterial sinopulmonary infections. Contrary to common belief, it does not increase the risk for severe parasitic infections.

IgG (Choice D) deficiency can present with recurrent sinopulmonary infections but also increases the risk for autoimmune disease. IgG subclass deficiency is frequently associated with IgA deficiency as well.

IgM (Choice E) deficiency may be asymptomatic or can present with recurrent upper respiratory tract infections and otitis media. Additionally, patients are at a higher risk for atopy, rhinitis, asthma, and anaphylaxis.

Educational Objective: IgA deficiency can be asymptomatic or can present with recurrent sinopulmonary infections and anaphylaxis to blood products. Diagnosis is made by measuring a low or absent concentration of IgA in the serum.

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3. A 67-year-old woman is brought to the emergency department by her husband after having a generalized tonic-clonic seizure at home. Her husband reports that shortly after awakening this morning, she had involuntary twitching of the right side of her face and right arm, lost consciousness, stiffened, and had generalized shaking for 2 minutes. She has type 2 diabetes mellitus and hypertension. Four months ago, she received the diagnosis of adenocarcinoma of the breast, metastatic to the lungs and bone. Current medications include metformin, atenolol, and letrozole. She is drowsy but able to follow simple commands with all extremities. Her temperature is 37°C (98.6°F), pulse is 90/min, and blood pressure is 160/90 mm Hg. She has a right lower facial droop. There is no meningismus. The pupils are 3 mm and reactive to light. The fundi are normal. There is conjugate gaze deviation to the patient's left. Muscle strength is 4/5 in the right upper extremity. Deep tendon reflexes are 3+ in the right upper extremity and 2+ elsewhere. Babinski sign is absent bilaterally. Laboratory studies show:

Hemoglobin	12 g/dL
Leukocyte count	3000/mm^3
Platelet count	80,000/mm^3
Serum	
Na^+	128 mEq/L
Glucose	70 mg/dL

Which of the following is the most likely cause of this patient's seizure?

A) Brain metastasis
B) Hypoglycemia
C) Hyponatremia
D) Intracerebral hemorrhage
E) Paraneoplastic limbic encephalitis

Correct Answer: A.

This patient with a history of breast adenocarcinoma presents with signs and symptoms of a focal to generalized tonic-clonic seizure. This presentation, in conjunction with her gaze preference, right lower facial droop, motor weakness, and hyperreflexia are consistent with the presence of a brain metastasis, likely within the left frontal lobe

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E) Paraneoplastic limbic encephalitis

Correct Answer: A.

This patient with a history of breast adenocarcinoma presents with signs and symptoms of a focal to generalized tonic-clonic seizure. This presentation, in conjunction with her gaze preference, right lower facial droop, motor weakness, and hyperreflexia are consistent with the presence of a brain metastasis, likely within the left frontal lobe. The brain is a common site of metastasis and metastatic lesions account for the majority of brain tumors in adults. Brain metastasis is particularly common in lung, breast, colon, and renal cell carcinomas, as well as melanomas. The majority of lesions occur within the cerebral hemispheres generally at the gray-white junction. Common presenting symptoms of brain metastasis include headache, altered or reduced cognition, seizures, and stroke. A minority of patients may present with paraneoplastic syndromes, such as syndrome of inappropriate antidiuretic hormone which likely accounts for this patient's hyponatremia. Suspicion of brain metastasis should prompt further evaluation with imaging. Treatment options vary depending upon the specific tumor involved and may include chemotherapy or radiotherapy.

Incorrect Answers: B, C, D, and E.

Hypoglycemia (Choice B) may lead to seizures if severe. Focal neurologic deficits such as a conjugate gaze preference would be unlikely. Further, this patient does not present with laboratory evidence of hypoglycemia.

Hyponatremia (Choice C), if acute and severe, may lead to central nervous system symptoms such as headache, nausea, vomiting, confusion, delirium, weakness, seizures, and coma. This patient with mild hyponatremia and focal neurologic deficits is more likely to have a brain metastasis. While there are exceptions, generally neurologic symptoms are uncommon at sodium concentrations greater than 120 mEq/L.

Intracerebral hemorrhage (Choice D) may lead to focal neurologic deficits but typically presents with acute onset headache and neurologic deficits, rather than seizures. However, seizures are common following intracerebral hemorrhage.

Paraneoplastic limbic encephalitis (Choice E) typically presents with a subacute altered mental status, confusion, hallucinations, short-term memory loss, psychosis, and insomnia. It is associated with the presence of autoantibodies including anti-Hu, anti-Ma, and anti-NMDA receptor.

Educational Objective: The brain, particularly the cerebral hemispheres, is a common site of metastasis via hematogenous dissemination. Metastatic lesions account for the majority of brain tumors in adults. Common presenting symptoms of brain metastasis include headache, altered or reduced cognition, seizures, and stroke.

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4. A 52-year-old man comes to the physician because of a 2-year history of progressive hearing loss in his right ear. He says he initially only noticed gradual changes in his hearing but has had severe hearing loss during the past 6 months. He also has had ringing in his right ear for 12 months and episodes of light-headedness and numbness and tingling on the right side of his face during the past month. He has a history of mild hypertension. Current medications include hydrochlorothiazide and 81-mg aspirin. He has been employed operating heavy equipment on construction sites for 30 years. He is not in distress. Vital signs are within normal limits. The external ear canals and tympanic membranes appear normal. He cannot hear whispered voice in the right ear. Air conduction is greater than bone conduction on the right. A tuning fork held over the forehead at midline is heard better on the left. Results of laboratory studies are within the reference range. Which of the following is the most likely diagnosis?

- A) Acoustic neuroma (vestibular schwannoma)
- B) Benign positional vertigo
- C) Drug toxicity
- D) Meniere disease
- E) Multiple sclerosis
- F) Vertebrobasilar insufficiency

Correct Answer: A.

This patient most likely has an acoustic neuroma (vestibular schwannoma) compressing the vestibulocochlear nerve and the trigeminal nerve. Acoustic neuromas are benign tumors consisting of Schwann cells that arise from the vestibulocochlear nerve. Since vestibulocochlear nerve function is disrupted, patients typically present with unilateral sensorineural hearing loss (consistent with decreased bone conduction in this patient's right ear), tinnitus, headache, and vestibular symptoms (as evidenced by this patient's light-headedness). Mass effect from progressively enlarging acoustic neuromas can compress the neighboring trigeminal nerve, explaining this patient's face numbness and paresthesia. Depending on patient age, tumor size, and symptom burden, acoustic neuromas can be managed with observation, radiation, or surgery.

Incorrect Answers: B, C, D, E, and F.

Benign positional vertigo (Choice B) involves a displaced otolith entering the semicircular canals but not the cochlea. Consequently, patients experience vertigo but not

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Correct Answer: A.

This patient most likely has an acoustic neuroma (vestibular schwannoma) compressing the vestibulocochlear nerve and the trigeminal nerve. Acoustic neuromas are benign tumors consisting of Schwann cells that arise from the vestibulocochlear nerve. Since vestibulocochlear nerve function is disrupted, patients typically present with unilateral sensorineural hearing loss (consistent with decreased bone conduction in this patient's right ear), tinnitus, headache, and vestibular symptoms (as evidenced by this patient's light-headedness). Mass effect from progressively enlarging acoustic neuromas can compress the neighboring trigeminal nerve, explaining this patient's face numbness and paresthesia. Depending on patient age, tumor size, and symptom burden, acoustic neuromas can be managed with observation, radiation, or surgery.

Incorrect Answers: B, C, D, E, and F.

Benign positional vertigo (Choice B) involves a displaced otolith entering the semicircular canals but not the cochlea. Consequently, patients experience vertigo but not hearing loss. As well, trigeminal neuralgia would be atypical.

Drug toxicity (Choice C) is unlikely. Aspirin may be rarely associated with sensorineural hearing loss, but it does not typically cause vestibular symptoms or trigeminal neuralgia.

Meniere disease (Choice D) is a condition of episodic vertigo and sensorineural hearing loss that results from pressure accumulation in the endolymph of the inner ear. Patients typically present with episodic vertigo, hearing loss, and tinnitus. This patient's hearing loss and vestibular symptoms were gradual and progressive, not episodic.

Multiple sclerosis (Choice E) is an immune-mediated demyelinating condition that presents with neurologic deficits separated in space and time, generally following a relapsing, remitting course. This patient has progressive symptoms involving a single neurologic territory (not separated in space).

Vertebrobasilar insufficiency (Choice F) describes ischemia of the posterior cerebral circulation and typically presents with vertigo, light-headedness, disequilibrium, ataxia, and nystagmus (caused by decreased blood supply to the vestibular nuclei). It is most commonly caused by atherosclerosis. The onset is typically sudden and episodic rather than gradual, and trigeminal neuralgia would be atypical.

Educational Objective: Acoustic neuromas may compress the vestibulocochlear and facial nerves. Acoustic neuromas can cause ipsilateral hearing loss and positional dizziness and, if compressing the trigeminal nerve, can lead to facial numbness and paresthesia.

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5. A 32-year-old man comes to the clinic because of a slow-healing lesion on his nose that has been present for the past year. The patient is a member of the US National Guard and says he first noticed the lesion 2 months after he returned home from deployment to Southwest Asia. The lesion initially appeared as two small pimples but gradually enlarged to form a single open sore, eventually developing a scaly crust. The lesion has not been painful or itchy. Aside from several insect bites and itching at various times during his deployment, he had no skin trauma or infections and did not have any significant contact with the local population or animals. He received all required vaccines, including smallpox, anthrax, and typhoid, prior to his deployment. He has no history of serious illness and takes no medications. Vital signs are within normal limits. A photograph of the lesion is shown. The lesion is not tender. Which of the following is the most likely diagnosis?

A) Anthrax
B) Leishmaniasis
C) Psoriasis
D) Squamous cell carcinoma
E) Tinea corporis

Correct Answer: B.

This patient's slow-healing lesion on the nose is most consistent with a diagnosis of leishmaniasis. Leishmaniasis is classified as Old World or New World based on the pathogen responsible and its geographic distribution. *Leishmania tropica* is the cause of Old World leishmaniasis, and the most frequent cause of cutaneous leishmaniasis. The organism is transmitted via the sand fly and is endemic to the Middle East, Asia, and North Africa. New World leishmaniasis, caused by *Leishmania braziliensis*, is endemic to Central America and South America. Leishmaniasis has both cutaneous and visceral forms. Cutaneous leishmaniasis begins with an erythematous, slightly edematous papule at the site of the sand fly bite, typically on uncovered skin ince the flies do not penetrate clothing. Lesions increase in size and may ulcerate or become wart-like. In Old World leishmaniasis, a characteristic hyperkeratotic eschar may form. With time, additional lesions may develop and spread along the draining lymphatics. Visceral leishmaniasis presents with the slow onset of fever, malaise, weight loss, and organomegaly over several weeks to months. In both conditions, histopathologic visualization of amastigotes within macrophages on blood smear or tissue biopsy is diagnostic.

Incorrect Answers: A, C, D, and E.

Anthrax (Choice A) has both a cutaneous and pulmonary form of disease. Cutaneous infection is most common and is caused by inoculation of the site with *Bacillus*

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braziliensis, is endemic to Central America and South America. Leishmaniasis has both cutaneous and visceral forms. Cutaneous leishmaniasis begins with an erythematous, slightly edematous papule at the site of the sand fly bite, typically on uncovered skin ince the flies do not penetrate clothing. Lesions increase in size and may ulcerate or become wart-like. In Old World leishmaniasis, a characteristic hyperkeratotic eschar may form. With time, additional lesions may develop and spread along the draining lymphatics. Visceral leishmaniasis presents with the slow onset of fever, malaise, weight loss, and organomegaly over several weeks to months. In both conditions, histopathologic visualization of amastigotes within macrophages on blood smear or tissue biopsy is diagnostic.

Incorrect Answers: A, C, D, and E.

Anthrax (Choice A) has both a cutaneous and pulmonary form of disease. Cutaneous infection is most common and is caused by inoculation of the site with *Bacillus anthracis* spores. Approximately 14 days after inoculation, a small papule appears, which then grows, ulcerates, and develops a characteristically black and depressed eschar. Nearby lymphadenopathy and/or lymphangitis are also common. While some areas of this patient's lesion have black eschar, the overall presentation is more characteristic of cutaneous leishmaniasis.

Psoriasis (Choice C) presents as scaly, erythematous plaques. Psoriasis does not typically involve the face in adult patients and is not typically a single solitary nodule. Most often, psoriasis involves the extensor extremities, the intergluteal cleft, and the scalp. This patient's ulcerated nodule on the nasal tip, in light of his travel history to Southwest Asia, is suggestive of Old World cutaneous leishmaniasis.

Squamous cell carcinoma (Choice D) of the skin typically presents with a nonhealing ulcerative lesion with scale. It commonly occurs secondary to sun exposure, chronic draining sinus tracts, or immunosuppression. While this patient likely has a history of sun exposure during his military service, the latency period between ultraviolet exposure and development of squamous cell carcinoma is often decades. The patient's travel history and clinical appearance are more suggestive of Old World cutaneous leishmaniasis. Squamous cell carcinoma may be ruled out definitively with biopsy.

Tinea corporis (Choice E) is caused by a superficial dermatophyte infection of the skin, most often *Trichophyton tonsurans*. The classic appearance is a round, annular patch with a scaly border. Superficial dermatophyte infections of the face are called tinea faciei.

Educational Objective: Leishmaniasis occurs as a result of infection with *Leishmania tropica* (Old World leishmaniasis) or *Leishmania braziliensis* (New World leishmaniasis), which are transmitted via the sand fly bite. Cutaneous leishmaniasis begins with an erythematous, slightly edematous papule at the site of the sand fly bite, which then increases in size and may ulcerate or become wart-like. A characteristic hyperkeratotic eschar may form.

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6. A previously healthy nulligravid 18-year-old woman comes to the physician because of a 2-day history of increasingly severe pain in her left wrist and left knee. She first had diffuse joint stiffness 5 days ago during a flu-like illness. Her symptoms, except for the joint pain, resolved spontaneously without treatment. She now has difficulty holding heavy items in her left hand and has pain with weight bearing on her left side. She is sexually active with multiple partners. Her only medication is an oral contraceptive. Her temperature is 37.4°C (99.3°F), pulse is 75/min, and blood pressure is 134/82 mm Hg. There is no rash. Pelvic examination shows mucoid cervical discharge but no other abnormalities. Examination of the left wrist shows tenderness and no effusions; active and passive range of motion is limited by pain. The left knee is warm and markedly tender with a large effusion. The remainder of the examination shows no abnormalities. Analysis of left knee aspirate shows a leukocyte count of 85,000/mm^3 with 85% neutrophils, 10% monocytes, and 5% lymphocytes; a Gram stain of the fluid is negative. Cultures of the aspirate are pending, as are blood, pharyngeal, cervical, and rectal cultures. The patient is admitted to the hospital, and intravenous ceftriaxone and oral azithromycin are begun. After 2 days, all cultures show no growth. Which of the following is the most appropriate next step in management?

A) Continuation of current drug regimen
B) Determination of erythrocyte sedimentation rate
C) Serologic testing for parvovirus
D) Switching from ceftriaxone to naproxen therapy
E) Addition of linezolid to the medication regimen

Correct Answer: A.

Neisseria gonorrhoeae is a sexually transmitted gram-negative diplococci that can cause pharyngitis, urethritis, epididymitis, vaginitis, cervicitis, and pelvic inflammatory disease, as well as septic arthritis. Septic arthritis caused by gonococcal infection can present with fever, malaise, and polyarthritis or oligoarthritis. However, patients may also present solely with purulent arthritis of one or more extremity joints (eg, knees, elbows, ankles). Further evaluation of a septic joint (as evidenced in this patient by a swollen, erythematous joint with limited passive and active ranges of motion) includes arthrocentesis for synovial fluid analysis. In the setting of gonococcal arthritis, the synovial fluid leukocyte count will be greater than 20,000 to 50,000/mm^3, but no organisms will be visible on Gram stain because *Neisseria gonorrhoeae* is an intracellular organism. Blood cultures, cervical cultures, and cultures of the synovial fluid should also be obtained. Cultures from any site in gonococcal arthritis display imperfect sensitivity. In cases where cultures are negative, a presumptive diagnosis must be established based on clinical suspicion and response to therapy, which typically includes intravenous ceftriaxone and oral azithromycin. Treatment of gonococcal arthritis typically requires intravenous antibiotics for 1 to 2 weeks. Treatment should be

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Incorrect Answers: B, C, D, and E.

Determination of erythrocyte sedimentation rate (Choice B) is unlikely to be helpful in this patient. Erythrocyte sedimentation rate is a nonspecific marker of inflammation and is often increased in the setting of infection, autoimmune or rheumatologic disease, vasculitis, and malignancy.

Serologic testing for parvovirus (Choice C) is unnecessary. While parvovirus B19 may cause arthralgia and arthritis, this typically presents as a symmetric, bilateral arthritis involving the small joints of the distal upper and lower extremities.

Switching from ceftriaxone to naproxen therapy (Choice D) is incorrect. Premature discontinuation of antibiotic therapy will lead to inadequate treatment of gonococcal infection and can lead to damage of the affected joint.

Addition of linezolid to the medication regimen (Choice E) is inappropriate. While linezolid is effective in the treatment of infections caused by methicillin-resistant *Staphylococcus aureus*, it is ineffective against gram-negative organisms, including *N. gonorrhoeae*.

Educational Objective: Cultures are imperfectly sensitive in gonococcal septic arthritis. In cases where cultures are negative, a presumptive diagnosis must be established based on clinical suspicion and response to therapy, which typically includes intravenous ceftriaxone and oral azithromycin. Treatment of gonococcal arthritis typically requires intravenous antibiotics for 1 to 2 weeks. Treatment should be continued until an adequate response to treatment is observed.

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7. A 42-year-old woman comes to the physician because of a 1-day history of severe pain, swelling, and warmth in her left knee. She notes that she awoke with the pain 1 day after she did an aerobic kickboxing workout. Her temperature is 37.2°C (99°F), pulse is 86/min, and blood pressure is 120/70 mm Hg. The upper aspect of the left knee is erythematous and warm to the touch with an effusion. Range of motion is limited by pain. The remainder of the examination shows no abnormalities. Arthrocentesis is performed. Joint fluid analysis shows a leukocyte count of 17,000/mm^3 with 90% segmented neutrophils and intracellular calcium pyrophosphate crystals. Which of the following is the most appropriate pharmacotherapy at this time?

A) Oral acetaminophen
B) Oral doxycycline
C) Oral hydroxychloroquine
D) Oral ibuprofen
E) Intravenous nafcillin

Correct Answer: D.

Pseudogout results from calcium pyrophosphate crystalline deposition within the joint space and may manifest acutely following trauma, surgery, or extreme exertion. Crystalline deposition provokes an inflammatory response, leading to the classic presentation of joint pain, erythema, effusion, calor, and a decreased range of motion. Pseudogout most commonly affects the knee. The diagnosis may be confirmed with arthrocentesis, which shows the presence of calcium pyrophosphate crystals and an increased concentration of leukocytes. Plain film x-rays may demonstrate chondrocalcinosis and degenerative joint changes. First-line medical management includes nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen, colchicine, and oral glucocorticoids.

Incorrect Answers: A, B, C, and E.

Oral acetaminophen (Choice A) does not have anti-inflammatory properties and therefore does not address the underlying cause of this patient's pain. Acetaminophen is most effective for noninflammatory pain, such as pain caused by osteoarthritis.

Oral doxycycline (Choice B) is useful for the treatment of Lyme disease, which may present with joint pain. Lyme disease is caused by *Borrelia burgdorferi* infection and is

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C) Oral hydroxychloroquine

D) Oral ibuprofen

E) Intravenous nafcillin

Correct Answer: D.

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Oral doxycycline (Choice B) is useful for the treatment of Lyme disease, which may present with joint pain. Lyme disease is caused by *Borrelia burgdorferi* infection and is characterized by infectious, rather than crystalline, arthropathy.

Oral hydroxychloroquine (Choice C) is useful for the treatment of rheumatoid arthritis. Hydroxychloroquine does not have an established role in the treatment of pseudogout.

Intravenous nafcillin (Choice E) is appropriate for the treatment of septic arthritis caused by methicillin-sensitive *Staphylococcus aureus*. Septic arthritis is less likely in this patient since it typically presents with a fever.

Educational Objective: Pseudogout results from calcium pyrophosphate crystalline deposition within the joint space and presents with acute joint pain, erythema, effusion, calor, and a decreased range of motion, often following an episode of exertion. NSAIDs and colchicine are the mainstays of treatment.

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8. A 66-year-old man comes to the office because of worsening pain in his right shoulder that began 1 day after installing overhead tile in his house 9 months ago. Initially, the pain only affected his muscle strength but during the past month he has been unable to raise his arm higher than 90 degrees, even when the pain is mild. The pain is worse at night and improves moderately an hour or two after he wakes up in the morning. Medical history is noncontributory; the patient takes ibuprofen for the shoulder pain. Vital signs are within normal limits. Examination of the right shoulder shows mild muscular atrophy with no tenderness to palpation. Passive range of motion in the shoulder is full, except that the patient reports a "twinge" of discomfort during testing. Drop-arm testing is positive. Which of the following is the most likely diagnosis?

A) Adhesive capsulitis
B) Biceps tendinitis
C) Cervical nerve impingement
D) Labral tear
E) Rotator cuff tear

Correct Answer: E.

The rotator cuff is the group of muscles and tendons that act to seat the humeral head directly into the center of the glenoid during motion of the shoulder. These muscles also act, in concert with other muscles about the shoulder, to internally and externally rotate, abduct, and adduct the shoulder. These muscles include the subscapularis, teres minor, supraspinatus, and infraspinatus. The prime movements of these muscles at the glenohumeral joint include internal rotation (subscapularis), external rotation when in an adducted position (teres minor), external rotation (infraspinatus), and abduction (supraspinatus). The coupling and antagonistic action of these muscles seats the humeral head in the glenoid and provides a stable pivot upon which the larger, more powerful muscles of the shoulder, such as the latissimus dorsi, deltoid, and pectoralis major, can act. A rotator cuff tear typically occurs at the insertion of the tendons of the rotator cuff on the humeral head. Commonly, this occurs in the supraspinatus tendon; however, tears can occur in any of the rotator cuff tendons or at the myotendinous junction. Risk factors for rotator cuff tears include heavy labor, repetitive overhead lifting, diabetes mellitus, and vascular disease. Chronic disease leading to tendon degeneration as well as acute or repetitive microtrauma are thought to contribute to eventual tendon failure. The classic presentation of a rotator cuff tear is with pain and weakness in one of the axes of motion corresponding with the associated rotator cuff muscle. Late manifestations of a tear include clinically appreciable atrophy of the corresponding muscle.

Incorrect Answers: A, B, C, and D

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Incorrect Answers: A, B, C, and D.

Adhesive capsulitis (Choice A) is characterized by the progressive development of severe limitations of both active and passive shoulder motion. Patients experience an initial phase of severe pain followed over months by progressive loss of motion in all directions, and finally followed by a long phase of recovery. Normal passive range of motion in this patient renders the diagnosis unlikely.

Biceps tendinitis (Choice B) occurs because of irritation and inflammation of the long head of the biceps tendon near its origin at the supraglenoid tubercle. Pain and tenderness to palpation along the anterior aspect of the biceps near the shoulder are typical findings.

Cervical nerve impingement (Choice C) may cause radiculopathy and present with weakness, numbness, paresthesia, and pain in the dermatomal and myotomal distribution that correlates to the affected root.

Labral tears (Choice D) typically occur in overhead or throwing athletes, such as those who play basketball, volleyball, tennis, baseball, or football. Labral tears are uncommon in older adults engaging in overhead work.

Educational Objective: Rotator cuff injuries are common in adults. They typically present with pain and weakness in the direction of shoulder motion that corresponds with the action of the associated rotator cuff muscle.

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9. A 23-year-old man comes to the emergency department 45 minutes after the sudden onset of palpitations and mild shortness of breath that began while he was drinking beer with friends. He has not had chest pain or loss of consciousness. He has no history of serious illness and takes no medications. On arrival, he appears anxious. He is alert and fully oriented. His pulse is 138/min and regular, and blood pressure is 100/65 mm Hg; other vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 99%. The patient's tachycardia ends abruptly during the examination. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Atrial fibrillation
B) Atrioventricular nodal reentrant tachycardia
C) Multifocal atrial tachycardia
D) Sinus tachycardia
E) Ventricular tachycardia
F) Wandering atrial pacemaker

Correct Answer: B.

Supraventricular tachycardia (SVT) refers to an abnormally rapid heart rate and rhythm originating from above the ventricles, typically with a narrow QRS complex on ECG. Patients with SVT can manifest with acute symptoms of light-headedness, palpitations, diaphoresis, and syncope. SVT is typically a result of structural defects in the His-Purkinje system causing a reentrant pathway, such as in Wolff-Parkinson-White syndrome. Atrioventricular nodal reentrant tachycardia (AVNRT) is the most common form of SVT that occurs in structurally normal hearts and is characterized by a regular rhythm with abrupt onset and termination. It can occur spontaneously or be provoked by alcohol, caffeine, exertion, stress, or sympathomimetic medications. AVNRT occurs because of a functional, rather than anatomical, re-entry circuit. In normal sinus rhythm, electrical impulses traverse the AV node via two simultaneous pathways: a fast-conducting, long refractory period pathway and a slow-conducting, short refractory period pathway. The distal end of the fast-conducting pathway interacts with the slow-conducting pathway, triggering the refractory period and preventing a second impulse from being transmitted to the ventricles. However, if the slow pathway is then activated by a premature atrial beat (as may occur spontaneously or provoked as above), the slow pathway may conduct an impulse that then reaches the distal end of the fast pathway as the refractory period ends, allowing the impulse to be transmitted in a retrograde fashion through the AV node and setting up a reentry circuit. Initial management consists of vagal maneuvers, adenosine, calcium channel blockers, or β-adrenergic blockers. Hemodynamically unstable patients require electrical cardioversion.

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Incorrect Answers: A, C, D, E, and F.

Atrial fibrillation (Choice A) may present with episodic tachycardia, heart palpitations, shortness of breath, dizziness, and anxiety. An irregularly irregular rhythm would be expected.

Multifocal atrial tachycardia (Choice C) is characterized by an irregularly irregular rhythm and polymorphic P waves. It is associated with chronic pulmonary disease. Patients with polymorphic P waves but a normal heart rate are described as having a wandering atrial pacemaker (Choice F).

Sinus tachycardia (Choice D) typically has a more gradual, ramping onset and decrease. An abrupt change in heart rate is more consistent with a tachyarrhythmia.

Ventricular tachycardia (Choice E) is more often associated with underlying structural heart disease. Nonsustained ventricular tachycardia is often asymptomatic or may present with palpitations, chest pain, light-headedness, and dyspnea. Sustained ventricular tachycardia is potentially life-threatening because of loss of adequate cardiac output and risk for devolving into ventricular fibrillation. SVT is more likely in a young, otherwise healthy patient.

Educational Objective: AVNRT is the most common type of supraventricular tachycardia that occurs in structurally normal hearts and is often provoked by alcohol, caffeine, exertion, stress, or sympathomimetic medications. It is characterized by a regular rhythm along with an abrupt onset and termination.

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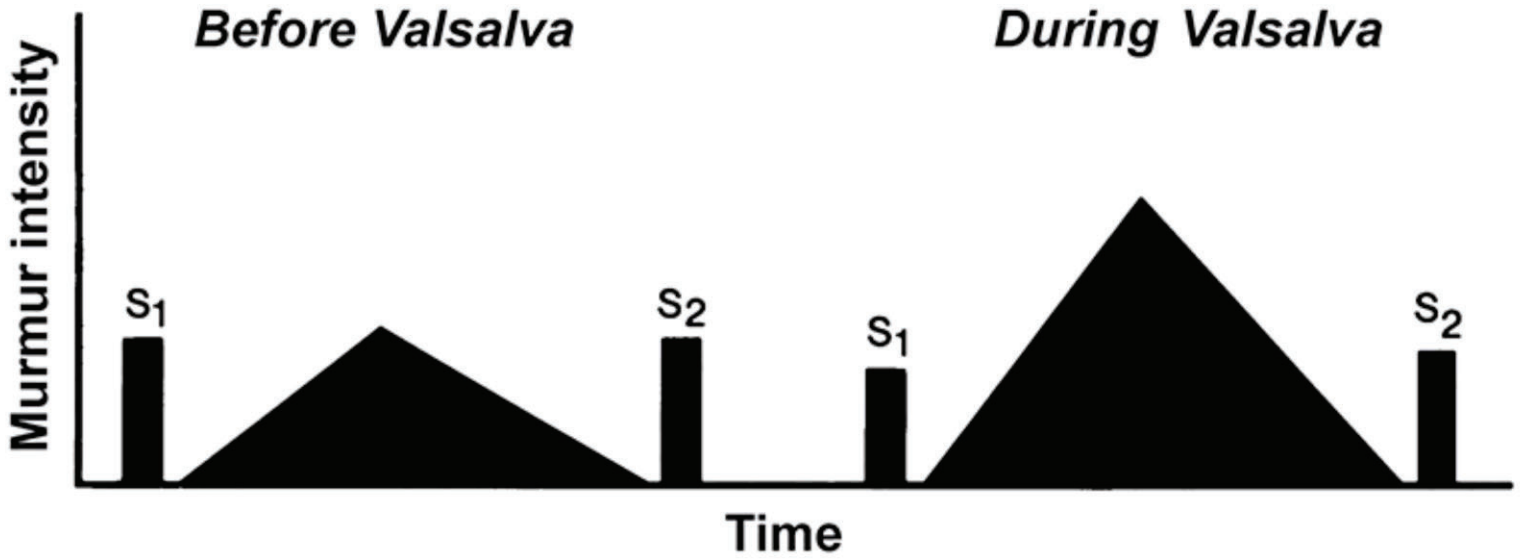

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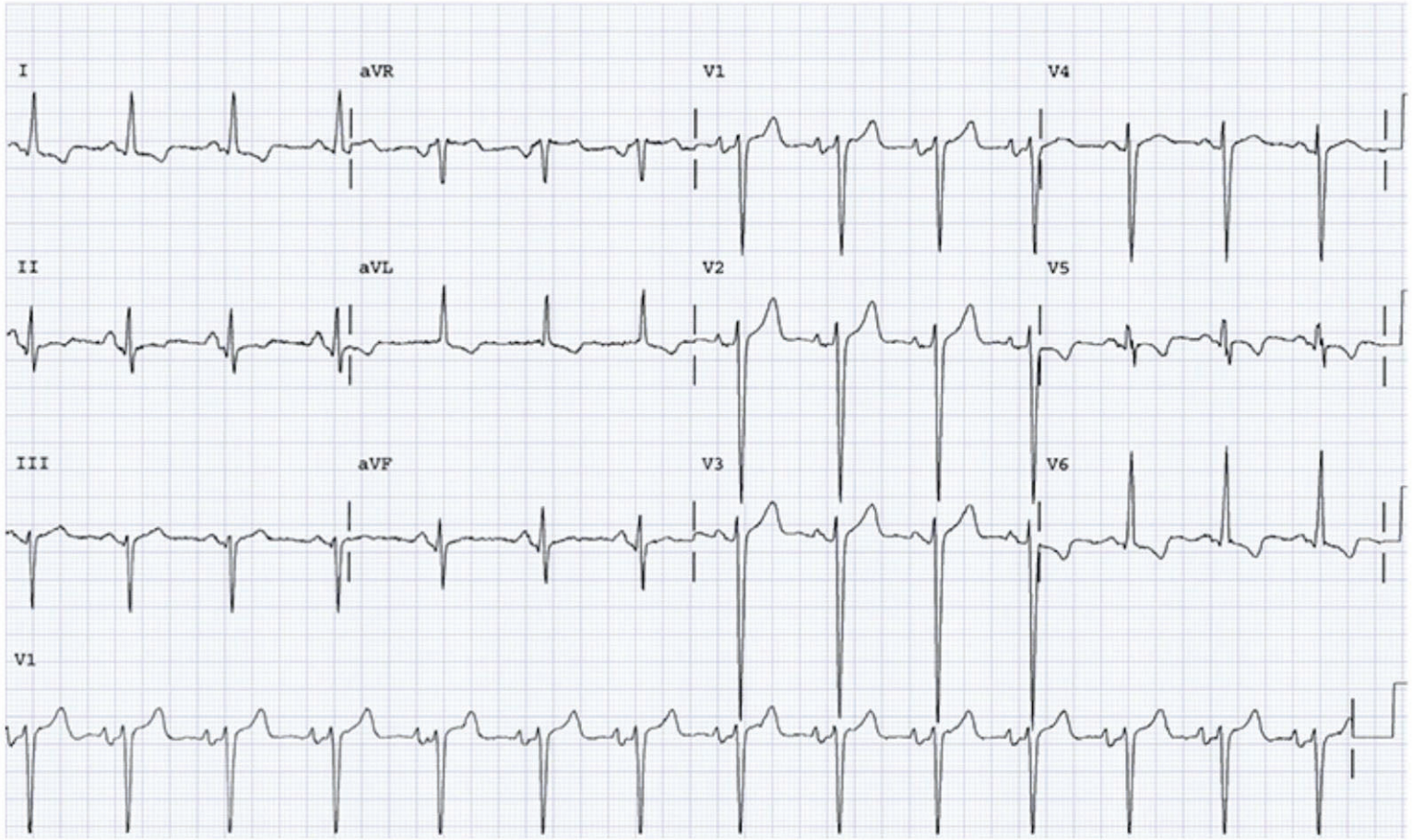

10. A previously healthy 32-year-old man comes to the office because of a 6-month history of palpitations, fatigue, and shortness of breath on exertion. He also has had occasional chest pain after eating large meals. He appears healthy and is not in acute distress. His pulse is 88/min, respirations are 12/min, and blood pressure is

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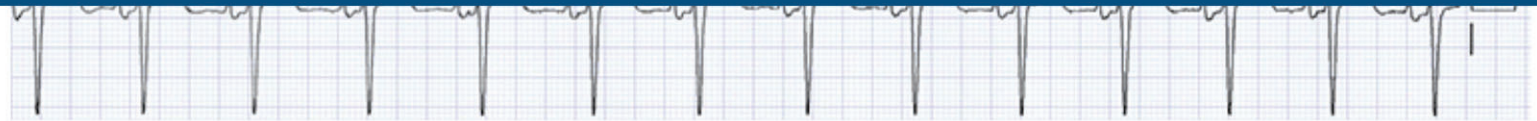

10. A previously healthy 32-year-old man comes to the office because of a 6-month history of palpitations, fatigue, and shortness of breath on exertion. He also has had occasional chest pain after eating large meals. He appears healthy and is not in acute distress. His pulse is 88/min, respirations are 12/min, and blood pressure is 138/86 mm Hg. Carotid pulses are forceful. Cardiac examination shows a left ventricular lift. An S_4 gallop and grade 3/6, harsh, systolic crescendo-decrescendo murmur are heard best at the lower left sternal border and apex. Results of Valsalva maneuver and ECG are shown. Which of the following is the most likely diagnosis?

A) Aortic sclerosis
B) Aortic stenosis
C) Hypertrophic obstructive cardiomyopathy
D) Mitral regurgitation
E) Mitral stenosis

Correct Answer: C.

The patient's presentation and diagnostic studies are consistent with hypertrophic obstructive cardiomyopathy, which classically presents with dyspnea, chest pain, syncope, or sudden cardiac death, often in an exercising young athlete with a potential family history of a similar event. Physical examination findings include a laterally displaced point of maximal impulse and a systolic murmur loudest in the lower left sternal border because of left ventricular outflow tract obstruction. The murmur characteristically becomes louder with the Valsalva maneuver, which decreases left ventricular filling and worsens the outflow tract obstruction. The ECG also displays evidence of left ventricular hypertrophy with large-amplitude S waves in the right-sided precordial leads and increased R-wave amplitude in V6.

Incorrect Answers: A, B, D, and E.

Aortic sclerosis (Choice A), or thickening of the aortic valve, is common as adults age because of repeated mechanical wear on the valve. It may or may not progress to clinically significant aortic stenosis (Choice B). Blood flow through a narrowed aortic valve characteristically results in a crescendo-decrescendo systolic murmur best

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B) Aortic stenosis

C) Hypertrophic obstructive cardiomyopathy

D) Mitral regurgitation

E) Mitral stenosis

Correct Answer: C.

The patient's presentation and diagnostic studies are consistent with hypertrophic obstructive cardiomyopathy, which classically presents with dyspnea, chest pain, syncope, or sudden cardiac death, often in an exercising young athlete with a potential family history of a similar event. Physical examination findings include a laterally displaced point of maximal impulse and a systolic murmur loudest in the lower left sternal border because of left ventricular outflow tract obstruction. The murmur characteristically becomes louder with the Valsalva maneuver, which decreases left ventricular filling and worsens the outflow tract obstruction. The ECG also displays evidence of left ventricular hypertrophy with large-amplitude S waves in the right-sided precordial leads and increased R-wave amplitude in V6.

Incorrect Answers: A, B, D, and E.

Aortic sclerosis (Choice A), or thickening of the aortic valve, is common as adults age because of repeated mechanical wear on the valve. It may or may not progress to clinically significant aortic stenosis (Choice B). Blood flow through a narrowed aortic valve characteristically results in a crescendo-decrescendo systolic murmur best heard at the upper right sternal border that gets softer with Valsalva maneuver.

Mitral regurgitation (Choice D) typically presents with a holosystolic murmur best heard in the left fourth or fifth intercostal space along the midclavicular line with radiation to the left axilla. It is often associated with mitral valve prolapse, endocarditis, acute rheumatic fever, and prior myocardial infarction.

Mitral stenosis (Choice E) is classically heard as an opening snap followed by a diastolic rumble, which is loudest over the cardiac apex, and radiates to the axilla. If severe enough, it can result in left atrial enlargement, cardiogenic pulmonary edema, and arrhythmias such as atrial fibrillation and flutter.

Educational Objective: Hypertrophic obstructive cardiomyopathy results from a thickened and stiff left ventricle, leading to outflow tract obstruction and diastolic dysfunction. Maneuvers that decrease preload or increase afterload (such as the Valsalva maneuver) accentuate the murmur as a result of increased incursion of the interventricular septum into the left ventricular outflow tract.

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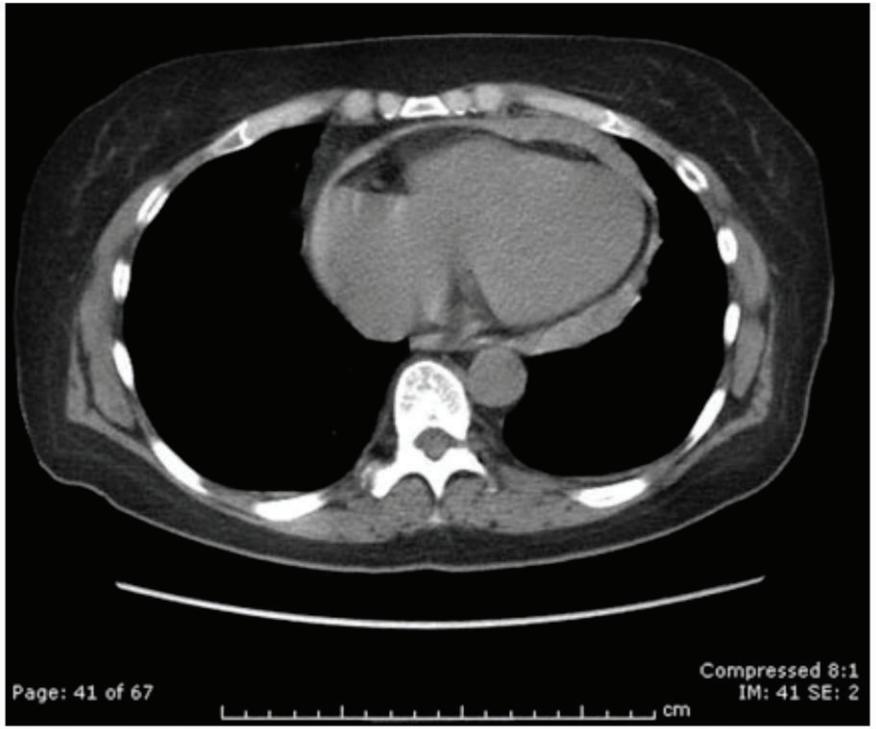
11. A 57-year-old woman comes to the emergency department because of a 1-day history of constant sharp chest pain and shortness of breath. The pain is located to the left of her sternum, increases when she lies on her back, and decreases when she sits and leans forward. She has had no cough, sputum production, recent trauma, or recent respiratory tract infection. She has hypertension and reactive airway disease. Medications are inhaled tiotropium, inhaled salmeterol-fluticasone, montelukast, amlodipine, and 81-mg aspirin. Her temperature is 37.6°C (99.6°F), pulse is 62/min, respirations are 24/min, and blood pressure is 87/55 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Jugular venous pressure is 9 cm H_2O. The remainder of the examination shows no abnormalities. Her hematocrit is 39%, leukocyte count is 15,800/mm^3, and platelet count is 252,000/mm^3. Serum electrolyte concentrations are within the reference ranges. An ECG shows diffuse ST-segment elevation. A CT scan of the chest with contrast is shown. Which of the following is the most appropriate next step in diagnosis?



A) Measurement of peak expiratory flow rate
B) Measurement of serum brain natriuretic peptide concentration
C) Measurement of serum cortisol concentration
D) Serum D-dimer assay
E) Blood cultures
F) Echocardiography
G) Pulmonary angiography

Correct Answer: F.

Echocardiography is the most appropriate next step in diagnosis. This patient with positional chest pain that worsens when she lies back and ECG changes including diffuse ST segment elevations most likely has pericarditis. Her other examination findings, including slightly increased jugular venous pressure and hypotension with

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D) Serum D-dimer assay
E) Blood cultures
F) Echocardiography
G) Pulmonary angiography

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Correct Answer: F.

Echocardiography is the most appropriate next step in diagnosis. This patient with positional chest pain that worsens when she lies back and ECG changes including diffuse ST segment elevations most likely has pericarditis. Her other examination findings, including slightly increased jugular venous pressure and hypotension with hypoxia suggest that she may also have heart failure or a hemodynamically significant pericardial effusion. Concomitant left ventricular dysfunction can sometimes accompany myopericarditis but is relatively uncommon. The CT scan demonstrates a small to moderate circumferential pericardial effusion, which is frequently seen in patients with pericarditis, but given this patient's hypoxia and hypotension, this should be urgently evaluated with echocardiography to ensure that she does not require a pericardiocentesis to treat pericardial tamponade. Echocardiography will also be able to evaluate left ventricular systolic function. Treatment of pericarditis typically includes high-dose aspirin or nonsteroidal anti-inflammatory drugs in combination with colchicine. Causes of pericarditis include viral infection, malignancy, autoimmune disease, and tuberculosis, although the majority are eventually deemed idiopathic.

Incorrect Answers: A, B, C, D, E, and G.

Measurement of peak expiratory flow rate (Choice A) is incorrect, since this patient does not have evidence of an asthma exacerbation.

Measurement of serum brain natriuretic peptide concentration (Choice B), if increased, would support a diagnosis of heart failure. Evaluation for heart failure could also be accomplished with echocardiography, which would further characterize the pericardial effusion.

Measurement of serum cortisol concentration (Choice C) is indicated if there is suspicion for adrenal insufficiency, but this patient's hypotension has a more likely cause related to her pericardial effusion.

Serum D-dimer assay (Choice D) is indicated for patients with a low pretest probability of pulmonary embolism in order to exclude the diagnosis. This patient's symptoms and ECG findings are more consistent with pericarditis.

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patients with pericarditis, but given this patient's hypoxia and hypotension, this should be urgently evaluated with echocardiography to ensure that she does not require a pericardiocentesis to treat pericardial tamponade. Echocardiography will also be able to evaluate left ventricular systolic function. Treatment of pericarditis typically includes high-dose aspirin or nonsteroidal anti-inflammatory drugs in combination with colchicine. Causes of pericarditis include viral infection, malignancy, autoimmune disease, and tuberculosis, although the majority are eventually deemed idiopathic.

Incorrect Answers: A, B, C, D, E, and G.

Measurement of peak expiratory flow rate (Choice A) is incorrect, since this patient does not have evidence of an asthma exacerbation.

Measurement of serum brain natriuretic peptide concentration (Choice B), if increased, would support a diagnosis of heart failure. Evaluation for heart failure could also be accomplished with echocardiography, which would further characterize the pericardial effusion.

Measurement of serum cortisol concentration (Choice C) is indicated if there is suspicion for adrenal insufficiency, but this patient's hypotension has a more likely cause related to her pericardial effusion.

Serum D-dimer assay (Choice D) is indicated for patients with a low pretest probability of pulmonary embolism in order to exclude the diagnosis. This patient's symptoms and ECG findings are more consistent with pericarditis.

Blood cultures (Choice E) are indicated for patients who have findings concerning for bacterial endocarditis, including persistent fever and embolic phenomena such as Janeway lesions and Osler nodes.

Pulmonary angiography (Choice G) is an invasive catheter-based procedure that is used to assess the pulmonary arterial vasculature. Historically, this was used to evaluate for the presence of pulmonary emboli, which has been largely replaced by CT angiography and ventilation-perfusion nuclear scans. Pulmonary angiography may still be used for thrombectomy therapy in the setting of a major pulmonary embolism with associated hemodynamic instability.

Educational Objective: Pericarditis is an inflammatory condition of the pericardium that causes positional chest pain that improves with leaning forward. ECG usually demonstrates diffuse ST segment elevations and/or PR segment depressions. Patients with hypotension and hypoxia, which are concerning for a hemodynamically significant pericardial effusion, should be evaluated urgently with echocardiography.

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12. A 25-year-old man comes to the physician because of a 2-day history of right calf pain that began after he played in a soccer match. The pain is worse with walking and resolves with rest or acetaminophen therapy. He is otherwise healthy and takes no other medications. There is no family history of serious illness. The patient traveled outside the USA by plane 4 months ago. He drinks 48 oz of beer weekly. He does not smoke cigarettes or use illicit drugs. His pulse is 85/min, respirations are 14/min, and blood pressure is 120/80 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Skin examination shows ecchymoses over the anterior and lateral aspects of the right calf. There are no cords. The calves are symmetric in size, and there is no warmth. The right lower extremity is diffusely tender to deep palpation below the knee. Cardiopulmonary and neurologic examinations show no abnormalities. Gait is normal. Serum D-dimer concentration is less than 0.2 µg/mL (N<0.5) by ELISA. Which of the following is the most appropriate next step in diagnosis?

A) Compression ultrasonography of the right lower extremity
B) CT pulmonary angiography
C) Measurement of prothrombin and partial thromboplastin times
D) MRI of the right lower extremity
E) Venography of the right lower extremity
F) No further testing is indicated

Correct Answer: F.

Familiarity with the Wells criteria is useful for the clinician to determine the likelihood of the presence of deep venous thrombosis (DVT) and can reduce the pursuit of unnecessary diagnostic testing. Wells criteria stratify patients into those with a low risk or a high risk for DVT, based on the presence of the following factors: active cancer within 6 months, recently bedridden for longer than 3 days or major surgery within 12 weeks, calf swelling greater than 3 cm, collateral superficial veins, localized tenderness along the deep venous system, pitting edema of the affected leg, paralysis or paresis of the affected leg or recent plaster casting, previous DVT, and absence of an alternate diagnosis. Patients with a score of less than 2 are considered unlikely to have DVT. In these patients, the presence of a negative D-dimer test is sufficient to exclude the possibility of DVT and obviates the need for further workup. In patients with suspected DVT and a score greater than 2, ultrasonography can be performed to confirm the presence of DVT. Based on this patient's age, health status, and mechanism, it is more likely that he has strained a muscle or sustained a contusion while playing soccer.

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Incorrect Answers: A, B, C, D, and E.

Compression ultrasonography of the right lower extremity (Choice A) is not necessary. This patient demonstrates few findings suggestive of DVT and has a low risk score by Wells criteria.

CT pulmonary angiography (Choice B) is useful for the evaluation of patients suspected to have a pulmonary embolism. Pulmonary embolism generally presents with acute-onset shortness of breath and chest pain.

Measurement of prothrombin and partial thromboplastin times (Choice C) is not necessary but may be useful for evaluating patients with a suspected coagulopathy. This patient presents with bruising and soreness following a soccer match, which is not suggestive of an underlying coagulation disorder.

MRI of the right lower extremity (Choice D) is not typically required for the evaluation of DVT. While MRI is capable of detecting thrombosis within the venous system, ultrasonography is typically a highly sensitive, fast, and affordable test.

Venography of the right lower extremity (Choice E) is not typically used for the diagnosis of DVT. Ultrasonography does not require intravenous contrast or radiation exposure, narrowing the clinical indications for venography.

Educational Objective: Familiarity with the Wells criteria is useful for the clinician to determine the likelihood of the presence of DVT and can reduce the pursuit of unnecessary diagnostic testing. In patients with a low risk score, a negative D-dimer test is sufficient to exclude the possibility of a DVT and further testing is not indicated.

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13. Five days after discharge from the hospital following treatment of ischemic left hemispheric cerebral infarction, an 82-year-old man is brought to the physician because of repeated coughing after drinking liquids. Recovery in the hospital was complicated by right lower lobe pneumonia that resolved after treatment with antibiotics. The patient has lived in a skilled nursing care facility since discharge. He has no known allergies. His medications are lisinopril and aspirin. He is currently not in respiratory distress. Vital signs are within normal limits. Muscle strength is 3/5 in the right extremities and 5/5 in the left extremities. On mental status examination, he is alert and fully oriented. His speech is dysarthric, and he has occasional difficulty finding words. Which of the following is most likely to decrease this patient's risk for pulmonary complications?

A) Addition of metoclopramide with meals
B) Addition of a thickening agent to all liquids
C) Direct supervision when drinking liquids
D) Tracheostomy
E) Use of a straw when drinking liquids

Correct Answer: B.

Aspiration involves the inhalation of oropharyngeal or gastric contents into the airway, and it may lead to bacterial pneumonia because of the inhalation of bacteria, or pneumonitis. Aspiration occurs because of dysfunction of the swallowing mechanism, commonly caused by neurologic disorders such as stroke or dementia, impaired consciousness, anesthesia or endotracheal intubation, and increased age. Patients present with typical findings of pneumonia such as fever, dyspnea, cough, and production of sputum, which may be malodorous. Most patients display involvement of the dependent portion of the lung. Patients at risk for aspiration should undergo a swallowing evaluation with a speech language pathologist. Many patients with swallowing dysfunction benefit from thickened liquids, which are easier to swallow in a coordinated manner, decreasing the likelihood of aspiration.

Incorrect Answers: A, C, D, and E.

Addition of metoclopramide with meals (Choice A) does not address the underlying cause of aspiration, which in this patient is more likely a result of swallowing dysfunction secondary to stroke, rather than caused by nausea or gastroparesis with resultant emesis.

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C) Direct supervision when drinking liquids

D) Tracheostomy

E) Use of a straw when drinking liquids

Correct Answer: B.

Aspiration involves the inhalation of oropharyngeal or gastric contents into the airway, and it may lead to bacterial pneumonia because of the inhalation of bacteria, or pneumonitis. Aspiration occurs because of dysfunction of the swallowing mechanism, commonly caused by neurologic disorders such as stroke or dementia, impaired consciousness, anesthesia or endotracheal intubation, and increased age. Patients present with typical findings of pneumonia such as fever, dyspnea, cough, and production of sputum, which may be malodorous. Most patients display involvement of the dependent portion of the lung. Patients at risk for aspiration should undergo a swallowing evaluation with a speech language pathologist. Many patients with swallowing dysfunction benefit from thickened liquids, which are easier to swallow in a coordinated manner, decreasing the likelihood of aspiration.

Incorrect Answers: A, C, D, and E.

Addition of metoclopramide with meals (Choice A) does not address the underlying cause of aspiration, which in this patient is more likely a result of swallowing dysfunction secondary to stroke, rather than caused by nausea or gastroparesis with resultant emesis.

Direct supervision when drinking liquids (Choice C) is impractical and may not sufficiently protect the patient from aspiration.

Tracheostomy (Choice D) may actually increase the risk for small volume aspiration, since it may disrupt normal closure of the glottis when swallowing.

Use of a straw when drinking liquids (Choice E) may increase the risk for aspiration in patients with swallowing dysfunction, since it increases the flow rate of fluid entering the mouth in comparison to sipping liquids.

Educational Objective: Aspiration occurs as a result of dysfunction of the swallowing mechanism, commonly caused by neurologic disorders such as stroke or dementia, impaired consciousness, anesthesia or endotracheal intubation, and increased age. Many patients with swallowing dysfunction benefit from thickened liquids, which decrease the likelihood of aspiration.

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14. A 32-year-old woman with Crohn disease is being placed on total parenteral nutritional support. During insertion of a central venous catheter into the left subclavian vein, she has the sudden onset of severe chest pain, dyspnea, and agitation. She is supine, and a sterile drape is placed over her. Her medications are infliximab and prednisone. She appears malnourished and anxious. She is 157 cm (5 ft 2 in) tall and weighs 45 kg (100 lb); BMI is 18 kg/m^2. Examination shows diaphoresis. Which of the following is the most appropriate next step in management?

A) Leave the patient supine and reassure her that the procedure is going well
B) Remove the sterile drape and seat the patient in the upright position
C) Place the patient into Trendelenburg and left lateral decubitus position
D) Attempt to place the catheter in the right subclavian vein
E) Administer intravenous lorazepam and perform pericardiocentesis

Correct Answer: C.

Air embolism can occur in both venous and arterial circulations. Risk factors include thoracic trauma, barotrauma, decompression sickness, cardiothoracic surgery, and surgery of the head and neck. In addition, it can be a complication of central venous catheter insertion, although rare. Upright positioning, hypovolemia, and inhalation during instrumentation can increase the risk for developing air embolism. Symptoms vary based on the location and size of embolism. Typical symptoms of a large venous air embolism include acute shortness of breath, tachypnea, tachyarrhythmia, cough, hypoxia, and chest pain. Management of an air embolism includes supportive measures such as fluid resuscitation, oxygen administration, and placing the patient in a left lateral decubitus and Trendelenburg position in order to help confine the air in the right ventricular apex to reduce the consequences of further embolization.

Incorrect Answers: A, B, D, and E.

To leave the patient supine and reassure her that the procedure is going well (Choice A) or attempt to place the catheter in the right subclavian vein (Choice D) would be inappropriate since rapid recognition and management of an air embolism is important to prevent further complications.

Placing the patient in an upright position (Choice B) would be inappropriate since an upright position increases the risk for developing an air embolism and would

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B) Remove the sterile drape and seat the patient in the upright position

C) Place the patient into Trendelenburg and left lateral decubitus position

D) Attempt to place the catheter in the right subclavian vein

E) Administer intravenous lorazepam and perform pericardiocentesis

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Air embolism can occur in both venous and arterial circulations. Risk factors include thoracic trauma, barotrauma, decompression sickness, cardiothoracic surgery, and surgery of the head and neck. In addition, it can be a complication of central venous catheter insertion, although rare. Upright positioning, hypovolemia, and inhalation during instrumentation can increase the risk for developing air embolism. Symptoms vary based on the location and size of embolism. Typical symptoms of a large venous air embolism include acute shortness of breath, tachypnea, tachyarrhythmia, cough, hypoxia, and chest pain. Management of an air embolism includes supportive measures such as fluid resuscitation, oxygen administration, and placing the patient in a left lateral decubitus and Trendelenburg position in order to help confine the air in the right ventricular apex to reduce the consequences of further embolization.

Incorrect Answers: A, B, D, and E.

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Placing the patient in an upright position (Choice B) would be inappropriate since an upright position increases the risk for developing an air embolism and would exacerbate its complications.

Administering intravenous lorazepam and performing pericardiocentesis (Choice E) may be appropriate management in the case of cardiac tamponade but not air embolism.

Educational Objective: Air embolism typically presents with acute shortness of breath, tachypnea, tachyarrhythmia, cough, hypoxia, and chest pain. Management of an air embolism includes supportive measures such as fluid resuscitation, oxygen administration, and placing the patient in a left lateral decubitus and Trendelenburg position in order to help confine the air in the right ventricular apex to reduce the consequences of further embolization.

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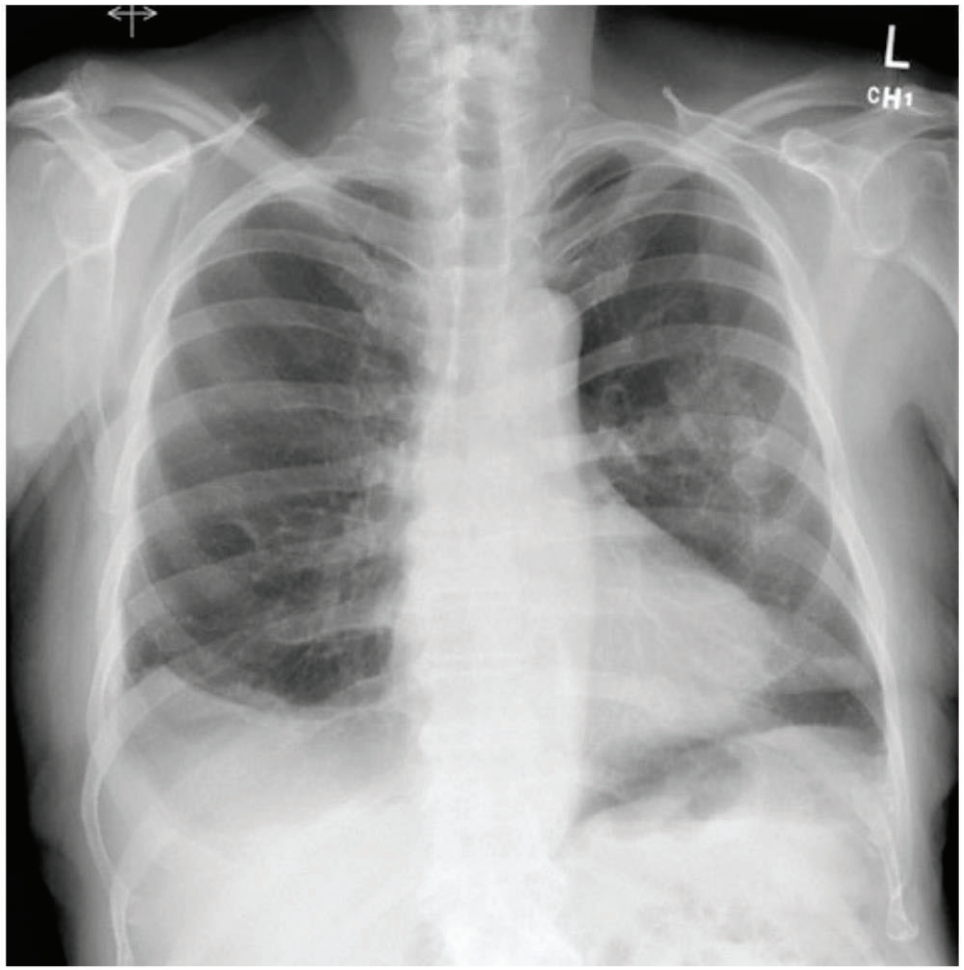

15. An 82-year-old man comes to the physician for a follow-up examination 1 week after discharge from the hospital, where he received treatment for streptococcal

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15. An 82-year-old man comes to the physician for a follow-up examination 1 week after discharge from the hospital, where he received treatment for streptococcal pneumonia. He received a 7-day course of intravenous ceftriaxone in the hospital, then completed a 4-day course of oral doxycycline at home. His fever, shortness of breath, cough, and chills resolved by the time of hospital discharge. He has hypertension and hyperlipidemia. His current medications are metoprolol, lisinopril, and atorvastatin. He smoked one pack of cigarettes daily for 50 years but quit 10 years ago. His blood pressure is 128/84 mm Hg. Breath sounds are decreased at the right lung base; no crackles, rhonchi, or rubs are heard. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hemoglobin	13.8 g/dL
Hematocrit	41%
Leukocyte count	5200/mm^3

A sputum culture shows no leukocytes or organisms. A chest x-ray is shown. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the chest
B) Lung biopsy
C) Pleural biopsy
D) Repeat sputum culture
E) No further testing is indicated

Correct Answer: E.

Pleural effusions occur as a result of multiple underlying conditions including infection such as pneumonia, malignancy such as lung cancer or mesothelioma, and increased hydrostatic pressure such as in left-sided heart failure. They are clinically suspected on examination in the setting of dullness to percussion and diminished

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B) Lung biopsy
C) Pleural biopsy
D) Repeat sputum culture
E) No further testing is indicated

Correct Answer: E.

Pleural effusions occur as a result of multiple underlying conditions including infection such as pneumonia, malignancy such as lung cancer or mesothelioma, and increased hydrostatic pressure such as in left-sided heart failure. They are clinically suspected on examination in the setting of dullness to percussion and diminished breath sounds, and they can be visualized on imaging including chest x-ray, CT, or ultrasonography. On frontal chest x-rays, pleural effusions are visualized as opacification and blunting of the costophrenic angle, as seen in the right hemithorax in this patient. A diagnostic thoracentesis should be performed whenever the cause of the effusion is unknown. A therapeutic thoracentesis can be used to relieve clinical symptoms. This patient's pleural effusion is likely reactive and secondary to his pneumonia, which seems adequately treated, since he no longer has fever, cough, or leukocytosis. The pleural effusion is small and asymptomatic, since the patient does not present with shortness of breath, tachypnea, or chest pain, and thus no further treatment or testing is indicated at this time.

Incorrect Answers: A, B, C, and D.

CT scan of the chest (Choice A) would be helpful in the diagnosis of a new, unexplained pleural effusion. However, this pleural effusion is likely reactive secondary to prior pneumonia, and the patient is currently asymptomatic, making further diagnostic testing unnecessary.

Lung or pleural biopsy (Choices B and C) can be helpful in the diagnosis of a malignant effusion, which would be less likely in this patient who was recently treated for streptococcal pneumonia. In addition, biopsy should not be attempted prior to further imaging such as a CT scan.

Repeat sputum culture (Choice D) would not be helpful in this case, since the patient has been properly treated for pneumonia and no longer displays any signs or symptoms of pneumonia.

Educational Objective: Pleural effusions can be reactive secondary to an adjacent pneumonia. Asymptomatic and small pleural effusions from a known cause without shortness of breath, tachypnea, or chest pain generally require no further testing or treatment.

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16. A 49-year-old man is admitted to the hospital because of a 2-year history of progressive, oily, foul-smelling diarrhea and an unintentional 18-kg (40-lb) weight loss. He has not had nausea, vomiting, melena, or rectal bleeding. He also has a 5-year history of intermittent joint pain and swelling of the wrists, hips, and knees. His wife reports that his memory has declined during the past month. He has no other history of serious illness and takes no medications. He is a farmer. He is 178 cm (5 ft 10 in) tall and weighs 57 kg (125 lb); BMI is 18 kg/m^2. His temperature is 36.3°C (97.3°F), pulse is 88/min, respirations are 16/min, and blood pressure is 124/82 mm Hg. Examination shows cervical, axillary, and inguinal lymphadenopathy. The abdomen is nontender to palpation; no masses are palpated. There is no hepatosplenomegaly. Bowel sounds are normal. Test of the stool for occult blood is positive. Endoscopic biopsy specimen of the small intestine shows numerous periodic acid–Schiff-positive macrophages in the lamina propria. Which of the following is the most appropriate next step in management?

A) Ceftriaxone therapy followed by trimethoprim-sulfamethoxazole therapy
B) Omeprazole, amoxicillin, and clarithromycin therapy
C) Pancreatic enzyme therapy
D) Prednisone therapy
E) Recommendation for gluten-free diet

Correct Answer: A.

This patient's constellation of findings is most consistent with Whipple disease. Whipple disease most often occurs in older men and is caused by infection with *Tropheryma whipplei*, an intracellular, gram-positive bacterium. Clinical manifestations of early infection include cardiac symptoms, arthralgias, and neurologic symptoms. With chronic infection, symptoms of intestinal malabsorption such as weight loss, vitamin deficiencies, and foul-smelling, oily diarrhea occur as a result of the presence of foamy macrophages and inflammation in the intestinal wall causing malabsorption. Diagnosis of Whipple disease is made with intestinal biopsies taken via upper endoscopy. A lumbar puncture should be performed for polymerase chain reaction testing of the cerebrospinal fluid to evaluate for central nervous system involvement. The initial treatment of Whipple disease, and most appropriate next step in management of this patient, is intravenous ceftriaxone for 2 weeks, followed by daily trimethoprim-sulfamethoxazole treatment for 1 year.

Incorrect Answers: B, C, D, and E.

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E) Recommendation for gluten-free diet

Correct Answer: A.

This patient's constellation of findings is most consistent with Whipple disease. Whipple disease most often occurs in older men and is caused by infection with *Tropheryma whipplei*, an intracellular, gram-positive bacterium. Clinical manifestations of early infection include cardiac symptoms, arthralgias, and neurologic symptoms. With chronic infection, symptoms of intestinal malabsorption such as weight loss, vitamin deficiencies, and foul-smelling, oily diarrhea occur as a result of the presence of foamy macrophages and inflammation in the intestinal wall causing malabsorption. Diagnosis of Whipple disease is made with intestinal biopsies taken via upper endoscopy. A lumbar puncture should be performed for polymerase chain reaction testing of the cerebrospinal fluid to evaluate for central nervous system involvement. The initial treatment of Whipple disease, and most appropriate next step in management of this patient, is intravenous ceftriaxone for 2 weeks, followed by daily trimethoprim-sulfamethoxazole treatment for 1 year.

Incorrect Answers: B, C, D, and E.

Omeprazole, amoxicillin, and clarithromycin therapy (Choice B) is used in the treatment of *Helicobacter pylori* infection, a common cause of peptic ulcer disease. Peptic ulcer disease does not present with symptoms of malabsorption. This patient's presentation is more characteristic of *T. whipplei* infection.

Pancreatic enzyme therapy (Choice C) is indicated in the management of chronic pancreatitis, another condition causing malabsorption and its associated symptoms. However, chronic pancreatitis does not cause neurologic impairment or arthralgias, which points to a diagnosis of Whipple disease in this case.

Prednisone therapy (Choice D) is not indicated because of the potential for worsening the underlying infection driving this patient's symptoms. As Whipple disease is caused by infection with *T. whipplei*, an antibiotic regimen aimed to eradicate this organism is the standard of care.

Recommendation for gluten-free diet (Choice E) is appropriate in the management of celiac disease. Celiac disease, caused by gluten-sensitivity, is another cause of malabsorption and may present with weight loss, steatorrhea, and foul-smelling, oily diarrhea. Celiac disease does not cause arthralgias and neurologic symptoms.

Educational Objective: Whipple disease, caused by infection with *Tropheryma whipplei*, classically causes signs of malabsorption (weight loss, vitamin deficiencies, and foul-smelling, oily diarrhea), cardiac symptoms, arthralgias, and neurologic symptoms. Treatment requires intravenous ceftriaxone for 2 weeks, followed by daily trimethoprim-sulfamethoxazole treatment for 1 year.

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17. A 47-year-old woman comes to the physician because of a 1-year history of difficulty swallowing liquids and solids. She says she often feels food and drink stick in the middle of her chest. For 8 weeks, she has been awakening at night after regurgitating partially digested food. After meals, she has mild heartburn that is occasionally associated with a mild sensation of fullness and discomfort in her chest. The heartburn is not relieved by over-the-counter antacids. She has had a 3.2-kg (7-lb) weight loss during the past 6 months. She has no history of serious illness. She does not smoke cigarettes or drink alcohol. She takes a daily multivitamin. Examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Achalasia
B) Esophageal carcinoma
C) Esophageal spasm
D) Gastroesophageal reflux disease
E) Pharyngoesophageal (Zenker) diverticulum

Correct Answer: A.

Achalasia is an esophageal dysmotility disorder resulting from deficient peristalsis as a result of impaired neuromuscular transmission and impaired relaxation of the lower esophageal sphincter (LES). It manifests as dysphagia, odynophagia, weight loss, reflux, halitosis, and regurgitation of undigested food. It is diagnosed with a barium swallow and esophageal manometry. Destruction of nerves in the myenteric plexus impairs local nitric oxide production, prevents smooth muscle relaxation, and affects neurons that function to relax the LES. An increase in LES pressure and dysfunctional peristalsis causes gradual dilatation of the esophagus with retention of food, leading to dysphagia and regurgitation. On barium esophagography, achalasia classically appears as a dilated esophagus with distal taper ("bird-beak" sign). Treatment includes pneumatic dilation or injection of botulinum toxin to relax the LES.

Incorrect Answers: B, C, D, and E.

Esophageal carcinoma (Choice B) typically presents with progressive dysphagia and can potentially appear similar to achalasia on esophagography (secondary achalasia), although this would be uncommon in a younger patient without significant risk factors.

Diffuse esophageal spasm (Choice C) is a condition in which the muscular layer of the esophagus is overactive. These spasms cause severe dysphagia and chest pain

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E) Pharyngoesophageal (Zenker) diverticulum

Correct Answer: A.

Achalasia is an esophageal dysmotility disorder resulting from deficient peristalsis as a result of impaired neuromuscular transmission and impaired relaxation of the lower esophageal sphincter (LES). It manifests as dysphagia, odynophagia, weight loss, reflux, halitosis, and regurgitation of undigested food. It is diagnosed with a barium swallow and esophageal manometry. Destruction of nerves in the myenteric plexus impairs local nitric oxide production, prevents smooth muscle relaxation, and affects neurons that function to relax the LES. An increase in LES pressure and dysfunctional peristalsis causes gradual dilatation of the esophagus with retention of food, leading to dysphagia and regurgitation. On barium esophagography, achalasia classically appears as a dilated esophagus with distal taper ("bird-beak" sign). Treatment includes pneumatic dilation or injection of botulinum toxin to relax the LES.

Incorrect Answers: B, C, D, and E.

Esophageal carcinoma (Choice B) typically presents with progressive dysphagia and can potentially appear similar to achalasia on esophagography (secondary achalasia), although this would be uncommon in a younger patient without significant risk factors.

Diffuse esophageal spasm (Choice C) is a condition in which the muscular layer of the esophagus is overactive. These spasms cause severe dysphagia and chest pain, often acutely in the setting of swallowing.

Gastroesophageal reflux disease (GERD) (Choice D) commonly occurs as a result of increased intra-abdominal pressure related to obesity or diminished closing pressure of the LES permitting acidic contents of the stomach to reflux into the esophagus. Chronic GERD can lead to intestinal metaplasia of the lower esophagus, which predisposes to esophageal adenocarcinoma.

A pharyngoesophageal (Zenker) diverticulum (Choice E) occurs as a result of an uncoordinated swallowing mechanism, which results in muscle spasms of the cricopharyngeus leading to the formation of a pulsion diverticula as the wall of the hypopharynx and superior esophagus weakens. It occurs primarily in older patients.

Educational Objective: Achalasia results from the destruction of neurons in the myenteric plexus resulting in dysfunctional peristalsis and a chronically increased LES tone. Presenting symptoms typically include dysphagia and regurgitation; progressive dilatation of the esophagus is seen on imaging. Treatment is with pneumatic dilation or injection of botulinum toxin to the LES.

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18. A 35-year-old woman comes to the office because of a 4-month history of progressive fatigue, generalized itching, and dry eyes and mouth. She has no history of serious illness and takes no medications. Her pulse is 80/min, and blood pressure is 123/77 mm Hg. Examination shows excoriations over the extremities. The liver span is 20 cm. The remainder of the examination shows no abnormalities. Laboratory studies show:

Serum	
Glucose	88 mg/dL
Creatinine	0.8 mg/dL
Total bilirubin	1.5 mg/dL
Alkaline phosphatase	300 U/L
AST	30 U/L
ALT	35 U/L
Antimitochondrial antibodies	positive

Liver biopsy shows lymphocytic infiltrates in portal tracts with loss of medium-sized interlobar bile ducts. Which of the following is the most appropriate pharmacotherapy?

A) Azathioprine
B) Colchicine
C) Methotrexate
D) Prednisone
E) Propranolol
F) Ursodeoxycholic acid

Correct Answer: F.

Primary biliary cirrhosis is an autoimmune disease of the biliary tree resulting in the destruction of intrahepatic bile ducts. It often affects middle-aged women. Because of

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pharmacotherapy?

A) Azathioprine
B) Colchicine
C) Methotrexate
D) Prednisone
E) Propranolol
F) Ursodeoxycholic acid

Correct Answer: F.

Primary biliary cirrhosis is an autoimmune disease of the biliary tree resulting in the destruction of intrahepatic bile ducts. It often affects middle-aged women. Because of disordered biliary excretion, it classically presents with jaundice, pruritus, hypercholesterolemia, increased alkaline phosphatase, and fat-soluble vitamin deficiencies. It is associated with a positive serum antimitochondrial antibody, although biopsy is needed for definitive diagnosis. Ursodeoxycholic acid is the first-line therapy, which improves biliary excretion, but liver transplantation may be necessary in progressive, severe disease.

Incorrect Answers: A, B, C, D, and E.

Treatment of some autoimmune disorders involves systemic steroids such as prednisone (Choice D) followed by long-term immunosuppressive therapy with medications such as azathioprine (Choice A) or methotrexate (Choice C). However, these drugs, as well as colchicine (Choice B), have shown little to uncertain benefit in primary biliary cirrhosis and are not recommended as first-line treatment.

Propranolol (Choice E) is a β-adrenergic blocker that can be used in the treatment of hypertension, anxiety disorders, and hyperthyroidism. It plays no role in the treatment of primary biliary cirrhosis.

Educational Objective: Ursodeoxycholic acid (ursodiol) is a medication that inhibits cholesterol secretion into bile, which consequently improves biliary excretion. It can be used to treat biliary colic, primary biliary cirrhosis, and intrahepatic cholestasis of pregnancy.

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19. A 72-year-old woman is hospitalized because of a 3-day history of increasingly severe central abdominal pain and bilious vomiting. Her only medications are hydrochlorothiazide and atorvastatin for hypertension and hyperlipidemia, respectively. She does not smoke cigarettes and drinks one glass of wine daily. Temperature is 38.2°C (100.8°F), pulse is 95/min, respirations are 18/min, and blood pressure is 120/75 mm Hg. Abdominal examination shows moderate epigastric and periumbilical tenderness without rebound. Results of laboratory studies are shown:

Total bilirubin	1.1 mg/dL
Alkaline phosphatase	180 U/L
AST	40 U/L
ALT	30 U/L
Amylase	350 U/L
Lipase	500 U/L (N=14–280)

Which of the following is the most likely cause of these findings?

A) Hyperlipidemia
B) Infection
C) Lithogenic bile
D) Medication adverse effect
E) Substance abuse

Correct Answer: C.

The patient's increased concentrations of lipase and amylase in the setting of typical epigastric pain are most consistent with acute pancreatitis. While there are numerous causes of acute pancreatitis, the most common nontraumatic causes include gallstones and heavy alcohol consumption. Gallstones form in the setting of lithogenic bile and may subsequently pass out of the gallbladder through the cystic duct and eventually reach the common bile duct (CBD). The main pancreatic duct also connects to the distal CBD, which is a conduit for pancreatic enzymes to reach the duodenum. If gallstones become lodged in the distal aspect of the CBD, obstruction of pancreatic flow can lead to the release and activation of pancreatic enzymes within the pancreas, which causes substantial inflammation and pain. Additionally, as the flow of bile

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E) Substance abuse

Correct Answer: C.

The patient's increased concentrations of lipase and amylase in the setting of typical epigastric pain are most consistent with acute pancreatitis. While there are numerous causes of acute pancreatitis, the most common nontraumatic causes include gallstones and heavy alcohol consumption. Gallstones form in the setting of lithogenic bile and may subsequently pass out of the gallbladder through the cystic duct and eventually reach the common bile duct (CBD). The main pancreatic duct also connects to the distal CBD, which is a conduit for pancreatic enzymes to reach the duodenum. If gallstones become lodged in the distal aspect of the CBD, obstruction of pancreatic flow can lead to the release and activation of pancreatic enzymes within the pancreas, which causes substantial inflammation and pain. Additionally, as the flow of bile toward the duodenum is obstructed, patients can develop hyperbilirubinemia and increased liver enzymes. Treatment for gallstone pancreatitis is either with cholecystectomy and intraoperative cholangiography or, in most cases, with endoscopic retrograde cholangiopancreatography to retrieve the obstructing gallstone. While awaiting procedural intervention, patients should be treated with intravenous fluids, pain medications, and antibiotics if there is suspicion for biliary tree infection.

Incorrect Answers: A, B, D, and E.

While hyperlipidemia (Choice A), such as hypertriglyceridemia, can cause pancreatitis, it is much less common than gallstone pancreatitis.

Gallstone pancreatitis is caused by the obstruction of pancreatic flow and activation of pancreatic enzymes within the pancreas, not a viral or bacterial infectious cause (Choice B).

Medication-related (Choice D) pancreatitis is rare but can occur secondary to direct toxic effect or accumulation of a toxic metabolite, such as with diuretics, sulfonamides, valproic acid, pentamidine, tetracycline, and others.

While substance abuse with alcohol (Choice E) may cause pancreatitis, alcoholic pancreatitis is not as common as gallstone pancreatitis. In addition, this patient consumes one glass of wine daily, whereas alcoholic pancreatitis occurs most often in patients with chronic alcohol abuse and dependence or in patients with a recent binge drinking episode.

Educational Objective: Gallstone pancreatitis occurs when a gallstone becomes lodged in the CBD at a point distal to where the pancreatic duct enters the CBD. It typically presents with acute epigastric pain and increased lipase and/or amylase concentrations. It may also cause associated cholangitis.

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20. A 16-day-old girl is brought to the physician for a well-child examination. She has a 1-week history of increasingly yellow skin. She was born at term following an uncomplicated pregnancy and delivery. Her birth weight was 3005 g (6 lb 10 oz). Newborn screening showed no abnormalities. She receives no medications. She is breast-feeding well. Today, she weighs 3062 g (6 lb 12 oz). Vital signs are within normal limits. Examination shows generalized jaundice and scleral icterus. Laboratory studies show a serum bilirubin concentration of 15 mg/dL, with a direct component of 10 mg/dL and an indirect component of 5 mg/dL. Urinalysis shows no reducing substances or pus. Which of the following is the most appropriate next step in management?

A) Weekly monitoring of serum bilirubin concentration
B) Abdominal ultrasonography
C) Upper gastrointestinal series
D) Oral administration of bile salts
E) Oral neomycin therapy

Correct Answer: B.

Neonatal jaundice with a preponderance of conjugated bilirubin, as indicated by an increased direct bilirubin, is suggestive of biliary atresia or other obstruction to biliary flow. Biliary atresia is caused by the abnormal underdevelopment of the extrahepatic biliary system. Affected infants can conjugate bilirubin normally in the liver but are unable to excrete bile into the gastrointestinal lumen. Affected infants present with worsening jaundice as a result of conjugated hyperbilirubinemia, along with pale stool, dark urine, poor weight gain, and, in untreated cases, cirrhosis, coagulopathy, and portal hypertension. Diagnosis consists of history and physical examination, liver function testing, and abdominal ultrasonography to evaluate any anatomic causes of cholestasis or presence of signs of biliary atresia, such as the absence of or an irregularly shaped gallbladder. Further imaging to confirm the diagnosis can involve a HIDA scan or cholangiography, with definitive diagnosis occurring during exploratory surgery with visualization of atretic bile ducts. Treatment is through hepatoportoenterostomy (Kasai procedure), which restores biliary flow, reduces jaundice, and helps salvage the native liver function. Liver transplantation may be required if the procedure is unsuccessful.

Incorrect Answers: A, C, D, and E.

Weekly monitoring of serum bilirubin concentration (Choice A) would be appropriate with physiologic jaundice, which is typically a predominantly unconjugated

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Incorrect Answers: A, C, D, and E.

Weekly monitoring of serum bilirubin concentration (Choice A) would be appropriate with physiologic jaundice, which is typically a predominantly unconjugated hyperbilirubinemia occurring in neonates. It is characterized by jaundice appearing around the first week of life, with slowly increasing bilirubin concentrations that decline to adult concentrations by the end of the third week of life. Concentrations generally do not exceed 12 to 18 mg/dL. Mild cases are usually self-limiting without complication.

Upper gastrointestinal series (Choice C) refers to a series of upper abdominal fluoroscopic images taken after the administration of oral contrast. This allows for the visualization of the proximal gastrointestinal tract to assess for a variety of conditions, such as duodenal atresia, malrotation, and midgut volvulus, among others. A gastrointestinal series is unable to identify biliary atresia.

Cholesterol is digested via emulsification with bile salts. Oral administration of bile salts (Choice D) is a treatment option for hypercholesterolemia.

Neomycin (Choice E) is an antibiotic that targets gram-negative bacteria, including gut flora. Biliary atresia is not caused by a bacterial infection, and neomycin would not be appropriate. In addition, it has many adverse effects including acute kidney injury and ototoxicity.

Educational Objective: Biliary atresia is caused by the abnormal underdevelopment of the extrahepatic biliary system. Affected infants present with worsening jaundice as a result of conjugated hyperbilirubinemia, along with pale stool, dark urine, poor weight gain, and, in untreated cases, cirrhosis, coagulopathy, and portal hypertension. Initial evaluation of neonates with direct hyperbilirubinemia should include abdominal ultrasonography to assess for potential anatomic causes.

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21. A previously healthy 27-year-old woman comes to the physician because of frequent urination and dysuria for 2 days. She has had no fever, chills, or back pain. She has had two similar episodes over the past 12 months treated with trimethoprim-sulfamethoxazole. Examination shows suprapubic tenderness to palpation. There is no costovertebral angle tenderness. Urinalysis shows 20–30 WBC/hpf and is positive for nitrites. Which of the following is the most appropriate measure to prevent recurrent symptoms?

A) Emptying the bladder one-half hour before vaginal intercourse
B) Ingestion of sodium bicarbonate in one-half glass of water 1 hour before vaginal intercourse
C) Amoxicillin therapy for the first 3 days of each month
D) Postcoital oral trimethoprim-sulfamethoxazole therapy
E) Propantheline therapy three times daily at the onset of symptoms

Correct Answer: D.

Lower urinary tract infections (UTIs) present with dysuria, frequency, urgency, and suprapubic discomfort. They occur more frequently in women than in men because of a shorter urethra and favorable regional environment for bacterial growth. Risk factors include the presence of a urinary catheter, anatomic genitourinary defects, diabetes mellitus, pregnancy, and frequent or recent sexual intercourse. Urinalysis will typically disclose bacteriuria, white blood cells, positive leukocyte esterase, and positive nitrites depending on the infectious organism. Treatment of uncomplicated UTIs typically consists of outpatient antibiotic management with trimethoprim-sulfamethoxazole, nitrofurantoin, or cephalexin. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of feminine hygiene practices to decrease the introduction of bacteria to the urethra. In patients with frequent urinary tract infections, management can involve prophylactic postcoital or daily antibiotic therapy.

Incorrect Answers: A, B, C, and E.

Emptying the bladder one-half hour before vaginal intercourse (Choice A) or ingestion of sodium bicarbonate before vaginal intercourse (Choice B) would be unlikely to help prevent UTIs. Voiding after, not before, sexual intercourse can help prevent UTIs.

Amoxicillin therapy for the first 3 days of each month (Choice C) would be inappropriate. Antibiotic prophylaxis only after coitus or daily trimethoprim-sulfamethoxazole

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C) Amoxicillin therapy for the first 3 days of each month

D) Postcoital oral trimethoprim-sulfamethoxazole therapy

E) Propantheline therapy three times daily at the onset of symptoms

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Incorrect Answers: A, B, C, and E.

Emptying the bladder one-half hour before vaginal intercourse (Choice A) or ingestion of sodium bicarbonate before vaginal intercourse (Choice B) would be unlikely to help prevent UTIs. Voiding after, not before, sexual intercourse can help prevent UTIs.

Amoxicillin therapy for the first 3 days of each month (Choice C) would be inappropriate. Antibiotic prophylaxis only after coitus or daily trimethoprim-sulfamethoxazole prophylaxis are adequate regimens to prevent recurrent urinary tract infections. In addition, amoxicillin would not be an appropriate antibiotic to treat a UTI.

Propantheline (Choice E) is an antimuscarinic agent that can be used as an antispasmodic such as in irritable bowel syndrome or in peptic ulcer disease. It can also be used in the treatment of neurogenic bladder. This patient's dysuria, frequent urination, and leukocytes on urinalysis are more suggestive of a UTI.

Educational Objective: Lower urinary tract infections present with dysuria, frequency, urgency, and suprapubic discomfort. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of feminine hygiene practices to decrease the introduction of bacteria to the urethra. In patients with frequent urinary tract infections, management can involve prophylactic postcoital or daily antibiotics.

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22. An 18-year-old man who is a college student comes to the office for a follow-up examination 3 days after routine dipstick urinalysis during a sports physical examination showed proteinuria. Repeat dipstick urinalysis 2 days later was negative for protein. He has no history of serious illness and takes no medications. Today, vital signs are within normal limits. Examination shows no abnormalities. Microscopic examination of urine sediment shows no abnormalities. Which of the following is the most appropriate next step in management regarding the change in urine findings?

A) Bone marrow biopsy
B) 24-Hour protein collection
C) Kidney biopsy
D) Urine protein immunoelectrophoresis
E) No management is indicated

Correct Answer: E.

A positive urine dipstick for protein is common in children, and proteinuria can be transient, intermittent, orthostatic, or persistent. Persistent proteinuria is uncommon and raises suspicion and risk for intrinsic kidney disease such as early glomerulonephrosis or nephritis. A patient with a repeat dipstick that shows no proteinuria and who is asymptomatic likely has transient proteinuria, which is a benign condition that self-resolves and requires no further evaluation. Transient proteinuria is a common cause of proteinuria in children. In children who are symptomatic, show signs of volume overload, and/or have signs of kidney disease such as hematuria, pyuria, or casts, further evaluation should be done to evaluate for glomerulonephritis, nephrotic syndrome, or other renal parenchymal disorders since early diagnosis improves outcomes and permits intervention.

Incorrect Answers: A, B, C, and D.

Bone marrow biopsy (Choice A) is used in the evaluation of hematologic disorders and malignancies such as multiple myeloma, aplastic anemia, acute myeloid leukemia, and acute lymphoblastic leukemia. It has no role in the evaluation of proteinuria outside of concomitant hematologic malignancy. Renal biopsy may be appropriate in cases of persistent proteinuria.

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D) Urine protein immunoelectrophoresis

E) No management is indicated

Correct Answer: E.

A positive urine dipstick for protein is common in children, and proteinuria can be transient, intermittent, orthostatic, or persistent. Persistent proteinuria is uncommon and raises suspicion and risk for intrinsic kidney disease such as early glomerulonephrosis or nephritis. A patient with a repeat dipstick that shows no proteinuria and who is asymptomatic likely has transient proteinuria, which is a benign condition that self-resolves and requires no further evaluation. Transient proteinuria is a common cause of proteinuria in children. In children who are symptomatic, show signs of volume overload, and/or have signs of kidney disease such as hematuria, pyuria, or casts, further evaluation should be done to evaluate for glomerulonephritis, nephrotic syndrome, or other renal parenchymal disorders since early diagnosis improves outcomes and permits intervention.

Incorrect Answers: A, B, C, and D.

Bone marrow biopsy (Choice A) is used in the evaluation of hematologic disorders and malignancies such as multiple myeloma, aplastic anemia, acute myeloid leukemia, and acute lymphoblastic leukemia. It has no role in the evaluation of proteinuria outside of concomitant hematologic malignancy. Renal biopsy may be appropriate in cases of persistent proteinuria.

Children with persistent proteinuria should undergo further diagnostic evaluation and quantitative testing of proteinuria, such as with a 24-hour protein collection (Choice B). This patient has transient and resolved proteinuria, making this inappropriate.

Kidney biopsy (Choice C) would be done in the evaluation of renal parenchymal disorders such as nephrotic syndromes and nephritic syndromes, which may present with severe proteinuria and/or hematuria, which is not present in this patient.

Urine protein immunoelectrophoresis (Choice D) can be done to quantify the amount and type of protein or immunoglobulin present in urine, which can occur in multiple myeloma.

Educational Objective: Transient proteinuria is the most common cause of proteinuria in children and requires no further evaluation.

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23. A 37-year-old woman, gravida 4, para 4, has continued to have vaginal bleeding 2 hours after forceps delivery of a 4300-g (9-lb 8-oz) newborn at term. Pregnancy was complicated by gestational diabetes. During delivery, shoulder dystocia required hyperflexion of the maternal hips, suprapubic pressure, and manual rotation of the fetal shoulders. The patient's pulse is 115/min, and blood pressure is 90/55 mm Hg. The uterine fundus is firm and palpable at the umbilicus, and the placenta appears to have been delivered intact. Which of the following is the most likely cause of the vaginal bleeding?

- A) Genital tract laceration
- B) Myometrial atony
- C) Uterine inversion
- D) Uterine rupture
- E) Normal lochia

Correct Answer: A.

Postpartum bleeding or hemorrhage is commonly caused by uterine atony, genital tract laceration, or retained products of conception. Other, less common causes include a bleeding diathesis, placenta previa, abruptio placentae, and uterine inversion. Hemorrhage is classically defined as blood loss greater than 500 mL after vaginal birth or 1000 mL after cesarean delivery and is associated with symptoms of hemorrhagic shock, such as light-headedness, diaphoresis, tachycardia, and hypotension. Uterine atony is the most common cause of postpartum hemorrhage and is caused by a failure of the myometrium to contract and compress the placental blood vessels. It is more likely to occur in the setting of macrosomia, multiple gestations, prolonged labor, and uterine infection, and it is diagnosed with a soft uterus on abdominal examination. Genital tract lacerations can happen spontaneously during the childbirth process or be caused by obstetric intervention, such as manual manipulation of the fetus or operative vaginal delivery. Finally, retained placenta can cause significant postpartum bleeding as a result of the inability of the placental bed to involute. Initial management for postpartum hemorrhage includes fluid and blood product resuscitation, uterine massage, administration of uterotonic medications, examination of the vagina and cervix (or abdominal incision if cesarean delivery was performed), and manual extraction of retained products of conception if present on ultrasonography. More invasive management for uncontrolled hemorrhage includes dilatation and curettage, uterine vessel embolization, and hysterectomy. This patient had a fetus with macrosomia requiring hyperflexion of her hips and suprapubic pressure, which are likely to put more tensile stress on the genital tract, accompanied by manual manipulation of the fetus and operative vaginal delivery, making genital tract laceration the most likely cause of the vaginal bleeding.

Incorrect Answers: B, C, D, and E

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likely to occur in the setting of macrosomia, multiple gestations, prolonged labor, and uterine infection, and it is diagnosed with a soft uterus on abdominal examination. Genital tract lacerations can happen spontaneously during the childbirth process or be caused by obstetric intervention, such as manual manipulation of the fetus or operative vaginal delivery. Finally, retained placenta can cause significant postpartum bleeding as a result of the inability of the placental bed to involute. Initial management for postpartum hemorrhage includes fluid and blood product resuscitation, uterine massage, administration of uterotonic medications, examination of the vagina and cervix (or abdominal incision if cesarean delivery was performed), and manual extraction of retained products of conception if present on ultrasonography. More invasive management for uncontrolled hemorrhage includes dilatation and curettage, uterine vessel embolization, and hysterectomy. This patient had a fetus with macrosomia requiring hyperflexion of her hips and suprapubic pressure, which are likely to put more tensile stress on the genital tract, accompanied by manual manipulation of the fetus and operative vaginal delivery, making genital tract laceration the most likely cause of the vaginal bleeding.

Incorrect Answers: B, C, D, and E.

Myometrial atony (Choice B) can cause postpartum hemorrhage, since the placental vessels are not adequately compressed to cause hemostasis. However, this patient has a firm uterus on abdominal examination, making this cause less likely.

Uterine inversion (Choice C) occurs when the uterine fundus inverts into the endometrial or vaginal canal, often caused by excessive traction on the cord when applying fundal pressure during delivery of the placenta. Risk factors include uterine atony, macrosomia, preeclampsia, nulliparity, and placenta accreta.

Uterine rupture (Choice D) can occur intrapartum or postpartum and presents with fetal distress and loss of station (if intrapartum), abdominal pain, uterine tenderness, vaginal bleeding, and abnormal uterine shape on examination. It can be accompanied by hemodynamic instability and requires operative repair. This patient has a firm uterine fundus, making rupture unlikely.

Normal lochia (Choice E) is vaginal discharge that is often bloody initially following delivery and may last up to 4 to 6 weeks. Lochia is not associated with significant blood loss. This patient has continuous bleeding, tachycardia, and hypotension, making blood loss caused by a genital tract laceration more likely.

Educational Objective: Postpartum hemorrhage can be caused by uterine atony, genital tract laceration, or retained products of conception. Genital tract lacerations are common with macrosomia and obstetric interventions, such as mechanical manipulation of the fetus and operative vaginal delivery. Initial management of postpartum hemorrhage includes hemodynamic support with fluid and/or blood products, uterine massage and uterotonics, vaginal examination and repair of lacerations, and manual extraction of retained products of conception.

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24. A previously healthy 27-year-old woman, gravida 1, para 1, comes to the physician because of a 2-week history of anxiety, irritability, and difficulty sleeping. During this time, she has noticed a mild tremor of her hands. Two months ago, she gave birth to a healthy male newborn at term. Delivery was uncomplicated. She is not breast-feeding. She initially attributed her symptoms to giving birth. Her only medication is a prenatal vitamin. She appears slightly anxious. Her temperature is 37.1°C (98.8°F), pulse is 108/min, respirations are 16/min, and blood pressure is 122/74 mm Hg. Examination shows a normal-sized thyroid that is slightly tender to palpation. There is a fine tremor of the outstretched hands. Laboratory studies show:

Hemoglobin	11.5 g/dL
Hematocrit	35%
Mean corpuscular volume	82 μm^3
Leukocyte count	9800/mm^3
Platelet count	410,000/mm^3
Serum	
Thyroid-stimulating hormone	0.3 μU/mL
Thyroxine (T_4)	12 μg/dL
Antithyroid peroxidase antibody	negative

Thyroid ^{123}I scintigraphy shows decreased uptake of radioactive iodine. Which of the following is the most appropriate next step in management?

A) Metoprolol therapy
B) Prednisone therapy
C) Propylthiouracil therapy
D) ^{131}I ablation
E) No further management is indicated

Correct Answer: A.

Postpartum thyroiditis is an autoimmune thyroiditis that occurs within a year of pregnancy. It has a similar cause to chronic lymphocytic (Hashimoto) thyroiditis and is

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D) Ablation

E) No further management is indicated

Correct Answer: A.

Postpartum thyroiditis is an autoimmune thyroiditis that occurs within a year of pregnancy. It has a similar cause to chronic lymphocytic (Hashimoto) thyroiditis and is associated both with particular human leukocyte antigen haplotypes as well as antithyroid peroxidase autoantibodies. Patients may present either with signs or symptoms of hyperthyroidism, as in this patient, typically followed by hypothyroidism, or with hypothyroidism alone. Measurement of TSH and free thyroxine (FT_4) is useful for establishing the diagnosis and typically displays abnormalities consistent with hyperthyroidism or hypothyroidism. Some patients display autoantibodies against thyroid peroxidase, while some do not. Patients with symptomatic hyperthyroidism benefit from treatment with metoprolol or propranolol. Those with symptomatic hypothyroidism benefit from treatment with levothyroxine. Most patients regain a euthyroid state after several months, although a minority of patients develop chronic hypothyroidism.

Incorrect Answers: B, C, D, and E.

Prednisone therapy (Choice B) may be helpful for the treatment of Graves disease and its complications, including Graves ophthalmopathy. It is also used in the management of thyroid storm. Patients with mild postpartum thyroiditis do not typically require glucocorticoid administration.

Propylthiouracil therapy (Choice C) is useful for the treatment of hyperthyroidism caused by Graves disease. It is not indicated in the setting of postpartum thyroiditis, in which the hyperthyroid state is transient and self-limiting.

^{131}I ablation (Choice D) is useful for hyperthyroidism caused by Graves disease but is harmful in the setting of postpartum thyroiditis. The natural history of the disease involves a gradual progression to hypothyroidism, with the majority of patients eventually achieving a euthyroid state.

No further management (Choice E) is inappropriate. Symptoms of hyperthyroidism may be deleterious to quality of life and typically respond well to treatment. Patients with postpartum thyroiditis who are asymptomatic should receive routine thyroid screening laboratory testing.

Educational Objective: Postpartum thyroiditis is an autoimmune thyroiditis that occurs within a year of pregnancy either with signs or symptoms of hyperthyroidism, typically followed by hypothyroidism, or with hypothyroidism alone. Patients with symptomatic hyperthyroidism benefit from treatment with an oral β-adrenergic blocker, such as metoprolol or propranolol.

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25. A 42-year-old woman comes to the office 2 months after noticing a mass in her left breast. There is no personal or family history of serious illness. Her last Pap smear 2 years ago and mammography 1 year ago showed no abnormalities. Menses occur at regular 28-day intervals and last 3 days. Her last menstrual period was 2 weeks ago. She is sexually active with one male partner and uses an oral contraceptive. She drinks four cups of coffee daily. Examination shows a 3-cm, firm, irregular mass in the upper outer quadrant of the left breast. Examination of the right breast shows no abnormalities. In addition to mammography, which of the following is the most appropriate next step in management?

A) Discontinue oral contraceptive and reexamine in 1 month
B) Perform breast biopsy
C) Perform breast MRI
D) Recommend discontinuing caffeine use
E) Reexamine in 1 month

Correct Answer: B.

The most appropriate next step in management in this case is to perform a breast biopsy in addition to mammography because this patient's relatively large, firm, and irregularly shaped mass is concerning for malignancy. Breast cancer encompasses many types of breast carcinoma, including invasive ductal and lobular carcinoma, medullary carcinoma, inflammatory breast carcinoma, and cystosarcoma phyllodes. The most common type is invasive ductal carcinoma, which typically presents as a palpable, immobile breast mass, which may demonstrate features such as spiculated margins and microcalcifications on mammography. The most common location for invasive ductal carcinoma is the upper outer quadrant of the breast. Evaluation of a breast mass first involves imaging with either mammography, if over the age of 35 years, or ultrasonography, if under the age of 35 years, to evaluate whether the palpable mass has features concerning for breast cancer. This is because younger women's breasts are denser and more challenging to evaluate with mammography than the breasts of older women. Mammography may be followed by ultrasonography. In this case, the mass has clinical features suspicious for malignancy so, along with mammography, a biopsy should be performed to rule out malignancy. Biopsy is invasive and reserved for cases of moderate to high clinical suspicion after investigation with diagnostic imaging takes place.

Incorrect Answers: A, C, D, and E.

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Correct Answer: B.

The most appropriate next step in management in this case is to perform a breast biopsy in addition to mammography because this patient's relatively large, firm, and irregularly shaped mass is concerning for malignancy. Breast cancer encompasses many types of breast carcinoma, including invasive ductal and lobular carcinoma, medullary carcinoma, inflammatory breast carcinoma, and cystosarcoma phyllodes. The most common type is invasive ductal carcinoma, which typically presents as a palpable, immobile breast mass, which may demonstrate features such as spiculated margins and microcalcifications on mammography. The most common location for invasive ductal carcinoma is the upper outer quadrant of the breast. Evaluation of a breast mass first involves imaging with either mammography, if over the age of 35 years, or ultrasonography, if under the age of 35 years, to evaluate whether the palpable mass has features concerning for breast cancer. This is because younger women's breasts are denser and more challenging to evaluate with mammography than the breasts of older women. Mammography may be followed by ultrasonography. In this case, the mass has clinical features suspicious for malignancy so, along with mammography, a biopsy should be performed to rule out malignancy. Biopsy is invasive and reserved for cases of moderate to high clinical suspicion after investigation with diagnostic imaging takes place.

Incorrect Answers: A, C, D, and E.

Discontinue oral contraceptive and reexamine in 1 month (Choice A) or reexamine in 1 month (Choice E) are not appropriate management options in this patient because of the high suspicion of malignancy. A delay in diagnosis of any cancer leads to the possibility of upstaging, when the stage of the tumor increases because of continued growth, which then consequently further diminishes prognosis.

Perform breast MRI (Choice C) is not indicated at this time. The most appropriate imaging for the evaluation of a breast mass in a patient over the age of 35 years is mammography, which is already being pursued in this case. The most important next step is to obtain a tissue sample of the mass in order to confirm or rule out a diagnosis of cancer.

Recommending discontinuing caffeine use (Choice D) is inappropriate at this time. This patient's breast mass is highly concerning for malignancy and should be biopsied as soon as possible.

Educational Objective: Evaluation of a breast mass first involves imaging with either mammography if over the age of 35 years, or ultrasonography if under the age of 35 years, to evaluate whether the palpable mass has features concerning for breast cancer. If the mass has clinical or radiographic features suggestive of malignancy, a breast biopsy is indicated to rule out malignancy.

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26. A 47-year-old woman comes to the physician because of heavy menstrual flow for 7 days. Menses usually occur at regular 28-day intervals and last 4 to 5 days. She has not had intermenstrual or postcoital bleeding. She has no history of serious illness and takes no medications. Bimanual examination shows a uterus consistent in size with a 20-week gestation. A Pap smear shows no abnormalities. Ultrasonography of the pelvis shows an enlarged uterus with three solid, well-circumscribed masses within the myometrium that are homogeneous in appearance. The largest mass is 7 cm in diameter. Results of an endometrial biopsy specimen show proliferative endometrium. Which of the following is the most likely diagnosis?

A) Adenocarcinoma
B) Adenomyosis
C) Endometrial hyperplasia
D) Endometritis
E) Leiomyomata uteri

Correct Answer: E.

Leiomyomata uteri, also known as uterine fibroids, are benign neoplasms of uterine myometrium and a common tumor in female patients. Fibroids commonly present with abnormal uterine bleeding during and/or between menses (commonly presenting as a heavy or prolonged menstrual period), pelvic pain, and miscarriage or infertility, and they are more common in African American patients. Physical examination commonly shows an enlarged, irregularly shaped uterus. Laboratory evaluation may disclose iron deficiency anemia if uterine bleeding is significant. Fibroids are typically well-visualized on pelvic ultrasonography. They are estrogen-responsive, causing increases in size with pregnancy and decreases in size with menopause. Treatment includes nonsteroidal anti-inflammatory drugs, combined oral contraceptives, gonadotropin-releasing hormone agonists, and surgical options such as myomectomy or hysterectomy for severe or complex cases.

Incorrect Answers: A, B, C, and D.

Endometrial adenocarcinoma (Choice A) or hyperplasia (Choice C) may present with abnormal uterine bleeding. Patients commonly present in the perimenopause period or, if premenopausal, with risk factors such as obesity, polycystic ovarian syndrome, or chronic anovulation. As well, a palpable uterus is more consistent with fibroids.

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B) Adenomyosis
C) Endometrial hyperplasia
D) Endometritis
E) Leiomyomata uteri

Correct Answer: E.

Leiomyomata uteri, also known as uterine fibroids, are benign neoplasms of uterine myometrium and a common tumor in female patients. Fibroids commonly present with abnormal uterine bleeding during and/or between menses (commonly presenting as a heavy or prolonged menstrual period), pelvic pain, and miscarriage or infertility, and they are more common in African American patients. Physical examination commonly shows an enlarged, irregularly shaped uterus. Laboratory evaluation may disclose iron deficiency anemia if uterine bleeding is significant. Fibroids are typically well-visualized on pelvic ultrasonography. They are estrogen-responsive, causing increases in size with pregnancy and decreases in size with menopause. Treatment includes nonsteroidal anti-inflammatory drugs, combined oral contraceptives, gonadotropin-releasing hormone agonists, and surgical options such as myomectomy or hysterectomy for severe or complex cases.

Incorrect Answers: A, B, C, and D.

Endometrial adenocarcinoma (Choice A) or hyperplasia (Choice C) may present with abnormal uterine bleeding. Patients commonly present in the perimenopause period or, if premenopausal, with risk factors such as obesity, polycystic ovarian syndrome, or chronic anovulation. As well, a palpable uterus is more consistent with fibroids.

Adenomyosis (Choice B) describes the growth of endometrial glands within the myometrium and is commonly seen in multigravid women. It presents with abnormal uterine bleeding and a symmetrically enlarged, boggy uterus. An irregularly shaped uterus with discrete masses would be atypical.

Endometritis (Choice D) is an acute bacterial infection of the endometrium. Symptoms include foul-smelling discharge, pelvic pain, fever, chills, and nausea.

Educational Objective: Leiomyomata uteri, or uterine fibroids, are estrogen-sensitive, benign neoplasms of the uterine myometrium that present with abnormal uterine bleeding, pelvic pain, and miscarriage or infertility. The uterus is typically large and irregularly shaped on physical examination and demonstrates discrete masses on pelvic ultrasonography.

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27. A 37-year-old nulligravid woman comes to the physician because she has been unable to conceive for 6 months. She has been married for 18 years and discontinued her oral contraceptive 6 months ago. She is an attorney, and she and her husband have sexual intercourse twice monthly. Menses occur at regular 28-day intervals. She feels well and has no history of serious illness. Physical examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Marital therapy to increase frequency of sexual intercourse
B) Use of an ovulation predictor kit to time sexual intercourse
C) Measurement of serum testosterone concentrations of the patient and her husband
D) Sildenafil therapy for the patient's husband
E) Intrauterine insemination during ovulation

Correct Answer: B.

Infertility is defined as the lack of conception with 1 year of unprotected sex in a woman under 35 years of age or with 6 months of unprotected sex in a woman aged 35 years or older. Evaluation of infertility should initially include a thorough history to elucidate details regarding the patient's menstrual and obstetric-gynecologic history, sexual practices, family history, and lifestyle factors that may impair fertility. A physical examination should occur and examine for reproductive organ abnormalities (eg, nodules in the posterior cul-de-sac, adnexal masses), as well as signs of insulin resistance, hyperandrogenism, and thyroid disorders. Laboratory evaluation may include semen analysis and measurements of follicle-stimulating hormone or estradiol, while imaging of the uterus and fallopian tubes can be used to rule out structural abnormalities. For fertilization of the egg and conception to occur, intercourse must be had either in the 5 days prior to ovulation or on the day of ovulation, with the highest rates of success occurring with intercourse 2 days prior to ovulation to the day of ovulation. Since this couple only has sex twice a month, the likelihood of them having sex on one of these days is low. Therefore, the most appropriate next step would be use of an ovulation predictor kit to time sexual intercourse for the greatest chance of success.

Incorrect Answers: A, C, D, and E.

Marital therapy to increase frequency of sexual intercourse (Choice A) is not warranted. While increasing the frequency of sexual intercourse may increase the chances of

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years or older. Evaluation of infertility should initially include a thorough history to elucidate details regarding the patient's menstrual and obstetric-gynecologic history, sexual practices, family history, and lifestyle factors that may impair fertility. A physical examination should occur and examine for reproductive organ abnormalities (eg, nodules in the posterior cul-de-sac, adnexal masses), as well as signs of insulin resistance, hyperandrogenism, and thyroid disorders. Laboratory evaluation may include semen analysis and measurements of follicle-stimulating hormone or estradiol, while imaging of the uterus and fallopian tubes can be used to rule out structural abnormalities. For fertilization of the egg and conception to occur, intercourse must be had either in the 5 days prior to ovulation or on the day of ovulation, with the highest rates of success occurring with intercourse 2 days prior to ovulation to the day of ovulation. Since this couple only has sex twice a month, the likelihood of them having sex on one of these days is low. Therefore, the most appropriate next step would be use of an ovulation predictor kit to time sexual intercourse for the greatest chance of success.

Incorrect Answers: A, C, D, and E.

Marital therapy to increase frequency of sexual intercourse (Choice A) is not warranted. While increasing the frequency of sexual intercourse may increase the chances of the couple having intercourse on the patient's day of ovulation, timing intercourse to occur near ovulation is more likely to be effective.

Measurement of serum testosterone concentration of the patient and her husband (Choice C) can be used to evaluate hormonal abnormalities that can lead to infertility. However, the patient and her husband have no signs to suggest that this is the cause of their infertility. More likely, their infrequent intercourse is not properly aligned with the patient's ovulation and fixing this should be the first priority in managing infertility.

Sildenafil therapy for the patient's husband (Choice D) is not necessary, since there is no mention of erectile dysfunction or failed ejaculation during their sexual intercourse. Thus, the timing of the intercourse in relation to the patient's ovulation is more likely to be the issue, and sildenafil will be unhelpful in managing this.

Intrauterine insemination during ovulation (Choice E) is not necessary at this time. While intrauterine insemination can be used to assist reproduction, it is an invasive procedure, and less invasive management techniques should be used first, such as optimal timing of intercourse.

Educational Objective: Infertility can be caused by a variety of lifestyle factors, anatomic abnormalities, and hormonal imbalances, among other causes. Evaluation of infertility typically begins when no conception has occurred after 1 year of regular intercourse in women under age 35 years or after 6 months in women aged 35 years and older. For fertilization to be successful, intercourse must occur in the 5 days prior to ovulation up until the day of ovulation. An ovulation predictor kit can be helpful in timing intercourse, especially when it is infrequent.

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28. A 32-year-old woman, gravida 2, para 2, comes to the physician for a routine health maintenance examination. At her last examination 1 year ago, a Pap smear and screening test results for sexually transmitted diseases were negative. Her two children, ages 6 and 4 years, were delivered by cesarean section. Her first child weighed 4394 g (9 lb 11 oz) at birth, and her second child weighed 4593 g (10 lb 2 oz) at birth. The patient is sexually active with her husband and uses an oral contraceptive. She is 157 cm (5 ft 2 in) tall and weighs 72 kg (158 lb); BMI is 29 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 84/min, respirations are 18/min, and blood pressure is 130/75 mm Hg. Physical examination shows no other abnormalities. Which of the following is the most appropriate screening test at this visit?

A) Measurement of fasting serum glucose concentration
B) Measurement of serum thyroid-stimulating hormone concentration
C) Urinalysis
D) Mammography
E) Transvaginal ultrasonography for endometrial thickness

Correct Answer: A.

Macrosomia is defined as a fetal weight exceeding 4000 g. Macrosomia is most commonly associated with maternal hyperglycemia and gestational diabetes mellitus. Human placental lactogen produced by the placenta increases maternal insulin resistance and results in gestational diabetes, which occurs when the mother's body cannot generate enough insulin to overcome the insulin resistance. This leads to increased concentrations of glucose in the maternal circulation, and subsequently the fetal circulation. Fetal hyperglycemia in turn causes the fetus to produce excess insulin, which acts as a growth factor and leads to macrosomia. Risk factors for gestational diabetes include obesity, polycystic ovary syndrome (PCOS), previous gestational diabetes, and African American, Asian American, Hispanic, Native American, and Pacific Islander ethnicity. Women with a history of gestational diabetes should be followed in the postpartum period and monitored for the development of diabetes mellitus. Fasting serum glucose or an oral glucose tolerance test are both appropriate screening methods.

Incorrect Answers: B, C, D, and E.

Measurement of serum thyroid-stimulating hormone concentration (Choice B) is useful for the monitoring of hypothyroidism and hyperthyroidism. This patient's history of macrosomia in her two children is more suggestive of gestational diabetes.

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E) Transvaginal ultrasonography for endometrial thickness

Correct Answer: A.

Macrosomia is defined as a fetal weight exceeding 4000 g. Macrosomia is most commonly associated with maternal hyperglycemia and gestational diabetes mellitus. Human placental lactogen produced by the placenta increases maternal insulin resistance and results in gestational diabetes, which occurs when the mother's body cannot generate enough insulin to overcome the insulin resistance. This leads to increased concentrations of glucose in the maternal circulation, and subsequently the fetal circulation. Fetal hyperglycemia in turn causes the fetus to produce excess insulin, which acts as a growth factor and leads to macrosomia. Risk factors for gestational diabetes include obesity, polycystic ovary syndrome (PCOS), previous gestational diabetes, and African American, Asian American, Hispanic, Native American, and Pacific Islander ethnicity. Women with a history of gestational diabetes should be followed in the postpartum period and monitored for the development of diabetes mellitus. Fasting serum glucose or an oral glucose tolerance test are both appropriate screening methods.

Incorrect Answers: B, C, D, and E.

Measurement of serum thyroid-stimulating hormone concentration (Choice B) is useful for the monitoring of hypothyroidism and hyperthyroidism. This patient's history of macrosomia in her two children is more suggestive of gestational diabetes.

Urinalysis (Choice C) is not necessary. While patients with diabetic nephropathy may display glucosuria and mild proteinuria, urinalysis is not typically used as an initial screening test to diagnose diabetes mellitus.

Mammography (Choice D) is not necessary. The United States Preventive Services Task Force recommends a screening mammogram every 1 to 2 years for patients over the age of 40 years.

Transvaginal ultrasonography for endometrial thickness (Choice E) can be helpful in evaluating endometrial hyperplasia, polyps, myomas, and other structural abnormalities of the uterus. It is not necessary in this context.

Educational Objective: Macrosomia is commonly associated with maternal hyperglycemia and gestational diabetes mellitus and is defined as a fetal weight greater than 4000 g. Women with a history of gestational diabetes should be followed in the postpartum period and monitored for the development of diabetes mellitus. Fasting serum glucose or an oral glucose tolerance test are both appropriate screening methods.

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29. A 47-year-old woman comes to the physician for a routine examination. Two years ago, she underwent total thyroidectomy for medullary cancer; her postoperative course was uncomplicated, but she did not keep her appointments for follow-up examinations. She says she feels well. She has never had radiation therapy. There is no family history of thyroid disease. Her only current medication is levothyroxine. Vital signs are within normal limits. Examination of the neck shows a well-healed surgical scar; there are no masses or cervical lymphadenopathy. The remainder of the examination shows no abnormalities. Which of the following serum measurements is most appropriate to order to determine if this patient's cancer is in remission?

A) CA 19-9
B) Calcitonin
C) Chromogranin A
D) Thyroglobulin
E) Thyroid-stimulating hormone

Correct Answer: B.

Medullary thyroid cancer is a malignancy that arises from thyroid parafollicular cells, which produce the hormone calcitonin. Patients commonly present with a thyroid nodule, while the production of excess calcitonin may lead to diarrhea and cutaneous flushing. Medullary thyroid cancer can only be cured by complete surgical excision. After surgery, monitoring of serum calcitonin concentrations is useful to detect the presence of residual disease or distant metastases. Undetectable calcitonin is suggestive of complete resection and remission. A normal serum concentration of carcinoembryonic antigen also portends a good prognosis. Patients with persistently detectable calcitonin have increased mortality in comparison with those in whom calcitonin is undetectable. Treatment for patients with persistent positive calcitonin is made on a case-by-case basis, but options include surgical excision or radiotherapy.

Incorrect Answers: A, C, D, and E.

CA 19-9 (Choice A) is commonly used to monitor the response to treatment of pancreatic adenocarcinoma. It is not typically used to monitor medullary thyroid cancer.

Chromogranin A (Choice C) is a useful marker for other neuroendocrine tumors, such as carcinoid syndrome and pancreatic neuroendocrine tumors. However, it is not as

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C) Chromogranin A

D) Thyroglobulin

E) Thyroid-stimulating hormone

Correct Answer: B.

Medullary thyroid cancer is a malignancy that arises from thyroid parafollicular cells, which produce the hormone calcitonin. Patients commonly present with a thyroid nodule, while the production of excess calcitonin may lead to diarrhea and cutaneous flushing. Medullary thyroid cancer can only be cured by complete surgical excision. After surgery, monitoring of serum calcitonin concentrations is useful to detect the presence of residual disease or distant metastases. Undetectable calcitonin is suggestive of complete resection and remission. A normal serum concentration of carcinoembryonic antigen also portends a good prognosis. Patients with persistently detectable calcitonin have increased mortality in comparison with those in whom calcitonin is undetectable. Treatment for patients with persistent positive calcitonin is made on a case-by-case basis, but options include surgical excision or radiotherapy.

Incorrect Answers: A, C, D, and E.

CA 19-9 (Choice A) is commonly used to monitor the response to treatment of pancreatic adenocarcinoma. It is not typically used to monitor medullary thyroid cancer.

Chromogranin A (Choice C) is a useful marker for other neuroendocrine tumors, such as carcinoid syndrome and pancreatic neuroendocrine tumors. However, it is not as useful for the monitoring of medullary thyroid cancer as calcitonin.

Thyroglobulin (Choice D) monitoring is useful after the surgical excision of papillary or follicular thyroid cancer but is not helpful in patients with a history of medullary thyroid cancer.

Thyroid-stimulating hormone (TSH) (Choice E) monitoring is not useful, since medullary thyroid cancer is derived from parafollicular cells, which are not responsive to TSH. Patients who have undergone surgical excision of the thyroid gland do, however, require supplementation of thyroid hormone with levothyroxine.

Educational Objective: Medullary thyroid cancer is a malignancy that arises from thyroid parafollicular cells, which produce the hormone calcitonin. After primary surgical excision, monitoring of serum calcitonin concentrations is useful to detect the presence of residual disease or distant metastases.

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30. A 54-year-old woman comes to the office because of a 1-day history of intermittent episodes of severe, sharp pain in the right side of her back that occur every 30 minutes. The episodes are associated with nausea; the patient has had two episodes of nonbloody vomiting since her symptoms began. During the past month she has had fatigue, generalized aches, and difficulty concentrating on simple tasks. She has had painful urination during the past 2 days. She has osteoarthritis treated with ibuprofen as needed. Her temperature is 37°C (98.6°F), pulse is 100/min, respirations are 20/min, and blood pressure is 146/90 mm Hg. The patient is in moderate distress and shifts around on the examination table. No murmurs are heard. Bowel sounds are normal. Abdominal examination shows tenderness to percussion at the right flank. There is no hepatosplenomegaly. Laboratory studies show:

Hemoglobin	12 g/dL	Urine	
Hematocrit	38%	Color	clear yellow
Leukocyte count	5100/mm^3	pH	7.0 (N=4.5–7.8)
Platelet count	204,000/mm^3	Specific gravity	1.018 (N=1.003–1.029)
Serum		Blood	grossly positive
Na^+	142 mEq/L	Glucose	negative
K^+	5 mEq/L	Bilirubin	negative
Cl^-	100 mEq/L	Protein	trace
HCO_3^-	25 mEq/L	Ketones	negative
Ca^{2+}	12 mg/dL	Nitrites	negative
Urea nitrogen	14 mg/dL	Leukocyte esterase	negative
Glucose	92 mg/dL	Urobilinogen	0.2 mg/2 hr (N=0.1–1.1)
Creatinine	0.9 mg/dL		

X-ray of the abdomen shows a 4-mm calcified calculus in the right ureteropelvic junction. There is no hydronephrosis. Which of the following is the most appropriate additional study at this time?

A) CT scan of the abdomen

B) Measurement of serum intact parathyroid hormone concentration

C) MRIs of the brain and abdomen

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X-ray of the abdomen shows a 4-mm calcified calculus in the right ureteropelvic junction. There is no hydronephrosis. Which of the following is the most appropriate additional study at this time?

A) CT scan of the abdomen
B) Measurement of serum intact parathyroid hormone concentration
C) MRIs of the brain and abdomen
D) Urine culture
E) No further testing is indicated

Correct Answer: B.

Measurement of serum intact parathyroid hormone (PTH) concentration is likely to confirm the diagnosis in this patient presenting with nephrolithiasis and hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from osseous resorption (osteitis fibrosa cystica), polyuria, dehydration, constipation, and psychiatric disturbances, along with hypophosphatemia, subperiosteal bone resorption, and renal failure. Hyperparathyroidism may be primary from a PTH-secreting source or secondary from increased stimulation of PTH production. Primary hyperparathyroidism is commonly caused by a parathyroid adenoma, followed by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of PTH results in increased serum calcium from increased osteoclast activity, intestinal absorption, and renal tubular absorption. Serum phosphorus concentration is decreased secondary to increased excretion by the renal tubules.

Incorrect Answers: A, C, D, and E.

CT scan of the abdomen (Choice A) or MRIs of the brain and abdomen (Choice C) are useful for the detection of malignancy, which may be encountered in hyperparathyroidism as a result of multiple endocrine neoplasia (MEN). This patient lacks other symptoms suggestive of malignancy within the pituitary or pancreas. Parathyroid adenomas are often small and difficult to detect without dedicated imaging. They are also located adjacent to the thyroid gland in the neck, which would not be visible on imaging of the brain or abdomen.

Urine culture (Choice D) may be useful for the evaluation of nephrolithiasis caused by urease-positive organisms, such as *Proteus* species. This patient's hypercalcemia is suggestive of hyperparathyroidism, rather than infection, as the underlying cause of nephrolithiasis.

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D) Urine culture

E) No further testing is indicated

Correct Answer: B.

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Urine culture (Choice D) may be useful for the evaluation of nephrolithiasis caused by urease-positive organisms, such as *Proteus* species. This patient's hypercalcemia is suggestive of hyperparathyroidism, rather than infection, as the underlying cause of nephrolithiasis.

No further testing (Choice E) is incorrect. Untreated hyperparathyroidism is associated with a variety of adverse outcomes, including an increased risk for cardiovascular disease, osteopenia, fractures, and nephrolithiasis.

Educational Objective: Hyperparathyroidism is a common endocrine disorder. Clinical manifestations are the result of hypercalcemia and include recurrent nephrolithiasis, bone pain, polyuria, volume depletion, constipation, and psychiatric disturbances.

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31. A 67-year-old woman is brought to the emergency department by her daughter because of a 2-day history of progressive fatigue, confusion, shortness of breath with exertion, and difficulty breathing when she lies flat. At night, she has had the sudden need to run to an open window for air. She had a myocardial infarction 2 years ago but has had no recent chest pain. Her medications are metoprolol, lisinopril, spironolactone, and furosemide. The daughter says that she does not know if her mother has taken her medications during the past 2 days. On arrival, the patient appears ill and in mild respiratory distress; she is ashen. Her temperature is 36.4°C (97.6°F), pulse is 102/min and regular, respirations are 24/min, and blood pressure is 82/46 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 89%. Examination shows jugular venous distention. Crackles are heard throughout the lower lung fields. On cardiac examination, an S_3 gallop is heard. There is 2+ pitting edema at the ankles. Intravenous administration of which of the following is the most appropriate next step in pharmacotherapy?

A) Ceftriaxone
B) Dopamine
C) Esmolol
D) Heparin
E) Nitroprusside

Correct Answer: B.

Dopamine is the most appropriate pharmacotherapy. This patient with prior myocardial infarction, hypotension, respiratory distress, hypoxia, jugular venous distention, peripheral edema, and confusion is most likely in cardiogenic shock. Appropriate pharmacotherapy for cardiogenic shock should provide positive inotropic support. This can be accomplished with dopamine, dobutamine, norepinephrine, or a combination of these medications. While norepinephrine as monotherapy or in conjunction with dobutamine is more commonly used for the treatment of cardiogenic shock in current practice, dopamine, when given at the correct dose, is also an appropriate choice. Dopamine targets different receptors at different concentrations. At low dose, it acts on D_1 receptors and actually causes vasodilation and may lead to hypotension. At midrange doses of 5 to 10 mcg/kg/min, it stimulates β_1 receptors and augments cardiac output, thereby increasing the mean arterial pressure. At higher doses, dopamine acts on α_1 receptors and further increases the systemic vascular resistance, but it also has a tendency to cause dangerous arrhythmias, so doses in this range are not frequently used. Mortality outcomes are comparable across chosen vasopressors; however, morbidity and complications were shown in the SOAP II trial to be worse in patients treated with dopamine.

Incorrect Answers: A, C, D, and E

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Correct Answer: B.

Dopamine is the most appropriate pharmacotherapy. This patient with prior myocardial infarction, hypotension, respiratory distress, hypoxia, jugular venous distention, peripheral edema, and confusion is most likely in cardiogenic shock. Appropriate pharmacotherapy for cardiogenic shock should provide positive inotropic support. This can be accomplished with dopamine, dobutamine, norepinephrine, or a combination of these medications. While norepinephrine as monotherapy or in conjunction with dobutamine is more commonly used for the treatment of cardiogenic shock in current practice, dopamine, when given at the correct dose, is also an appropriate choice. Dopamine targets different receptors at different concentrations. At low dose, it acts on D_1 receptors and actually causes vasodilation and may lead to hypotension. At midrange doses of 5 to 10 mcg/kg/min, it stimulates β_1 receptors and augments cardiac output, thereby increasing the mean arterial pressure. At higher doses, dopamine acts on α_1 receptors and further increases the systemic vascular resistance, but it also has a tendency to cause dangerous arrhythmias, so doses in this range are not frequently used. Mortality outcomes are comparable across chosen vasopressors; however, morbidity and complications were shown in the SOAP II trial to be worse in patients treated with dopamine.

Incorrect Answers: A, C, D, and E.

Ceftriaxone (Choice A) is a cephalosporin antibiotic and is appropriate pharmacotherapy for patients with community-acquired pneumonia, not cardiogenic shock.

Esmolol (Choice C) is a β-adrenergic blocker that acts to decrease blood pressure and heart rate. It is commonly used to lower blood pressure in patients with aortic dissections but would be deleterious for this patient with cardiogenic shock.

Heparin (Choice D) may be required if this patient undergoes cardiac catheterization, but it will have no meaningful effect on her clinical course as it is an anticoagulant, not an inotropic medication.

Nitroprusside (Choice E) is an arterial and venous dilator that is occasionally used for patients with acute decompensated heart failure to decrease both preload and afterload, thereby decreasing stress on the heart. However, it can have a profound impact on blood pressure and may lead to hypotension, so other medications are typically preferred in cardiogenic shock.

Educational Objective: Cardiogenic shock presents with hypotension and evidence of end-organ damage in patients with acute decompensated heart failure. First-line therapies include dobutamine, norepinephrine, or dopamine.

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32. A study is conducted to assess the incidence of mortality in children with idiopathic seizure disorder and children without seizure disorder. A total of 1283 age-matched patients without significant comorbidities are enrolled in the study and observed for 20 years. Results show that the mortality rate among the 692 children with seizure disorder for the 20-year period following diagnosis is 6.2%, whereas the mortality rate among the 591 children without seizure disorder for the same 20-year period is 0.8%. Which of the following is the most accurate conclusion based on this study population?

A) Children with idiopathic seizure disorder have a five times greater risk of mortality than children without seizure disorder
B) Children with idiopathic seizure disorder have more than a seven times greater risk of mortality than children without seizure disorder
C) Mortality risk cannot be determined with the data provided
D) The overall risk of mortality in children during a 20-year period is 5.4%
E) The overall risk of mortality in children during a 20-year period is 7%

Correct Answer: B.

Based on the study population, children with an idiopathic seizure disorder have more than a seven times greater risk for mortality than children without seizure disorder. The difference in risk for mortality between two groups can be expressed using a hazard ratio (HR). HRs are used to report outcomes in a survival analysis, as in this case. It is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of an unexposed group. In this case, the rate of the hazard (mortality) is 6.2% in the group exposed to the risk (idiopathic seizure disorder) compared with a rate of 0.8% in the age-matched controls who did not have idiopathic seizure disorder. The ratio of these two rates can be calculated as 6.2% / 0.8% = 7.75. Thus, there is more than a seven times greater risk for mortality in the idiopathic seizure disorder group than in the controls.

Incorrect Answers: A, C, D, and E.

The hazard ratio calculated in this case based on the mortality rates provided is equal to 7.75, not 5 (Choice A). Thus, children with idiopathic seizure disorder have a greater than seven times, not five times, risk for mortality.

It is false that the mortality risk cannot be determined (Choice C) because the values necessary to calculate a hazard ratio are simply the mortality rates of the two groups,

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C) Mortality risk cannot be determined with the data provided

D) The overall risk of mortality in children during a 20-year period is 5.4%

E) The overall risk of mortality in children during a 20-year period is 7%

Correct Answer: B.

Based on the study population, children with an idiopathic seizure disorder have more than a seven times greater risk for mortality than children without seizure disorder. The difference in risk for mortality between two groups can be expressed using a hazard ratio (HR). HRs are used to report outcomes in a survival analysis, as in this case. It is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of an unexposed group. In this case, the rate of the hazard (mortality) is 6.2% in the group exposed to the risk (idiopathic seizure disorder) compared with a rate of 0.8% in the age-matched controls who did not have idiopathic seizure disorder. The ratio of these two rates can be calculated as 6.2% / 0.8% = 7.75. Thus, there is more than a seven times greater risk for mortality in the idiopathic seizure disorder group than in the controls.

Incorrect Answers: A, C, D, and E.

The hazard ratio calculated in this case based on the mortality rates provided is equal to 7.75, not 5 (Choice A). Thus, children with idiopathic seizure disorder have a greater than seven times, not five times, risk for mortality.

It is false that the mortality risk cannot be determined (Choice C) because the values necessary to calculate a hazard ratio are simply the mortality rates of the two groups, which are provided.

The overall risk of mortality in children cannot be generalized from this study, since the study is not designed to find the general mortality rate of children over a twenty-year period. Thus, the overall mortality risk of children during a 20-year period is neither the difference between the mortality rates of the groups (5.4%) (Choice D) nor the addition of the mortality rates of the groups (7%) (Choice E).

Educational Objective: The difference in risk for mortality between two groups can be expressed using the HR. HR is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of an unexposed group. The hazard may be death, as in this case, or any other complication or negative outcome measured by the study.

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33. A study is being conducted to investigate the association between childhood exposure to secondhand cigarette smoke and risk for developing lung disease as an adult in individuals who have never smoked. A total of 500 adults with lung disease and 500 adults with no history of lung disease are enrolled in the study; participants in both groups are interviewed about exposure to secondhand cigarette smoke during childhood. Which of the following is the most appropriate measure of association for the investigators to report?

A) Absolute risk
B) Attributable risk
C) Hazard ratio
D) Odds ratio
E) Relative risk

Correct Answer: D.

The most appropriate measure of association to report in this study is the odds ratio. This study compares one group of patients with an outcome under study (lung cancer) (cases) against a second matched group without that outcome (controls) and identifies the associated exposure (childhood exposure to secondhand cigarette smoke) within each group. This study design is known as a case-control study. Case-control studies can be conducted in a prospective or retrospective manner but are always observational studies. By grouping patients by outcome and comparing differences in the odds of exposure, case-control studies can detect associations between the exposure and outcome, such as exposure to secondhand cigarette smoke in childhood and the odds of developing lung cancer. This is described statistically as an odds ratio (OR). Two unrelated variables will have an OR of 1.0, whereas positive association between an exposure and an outcome will have an OR greater than 1.0, and negatively associated variables will have an OR less than 1.0. Case-control studies are therefore capable of establishing an association between exposure and outcome, but they do not establish causality.

Incorrect Answers: A, B, C, and E.

Absolute risk (Choice A) is the risk for the study outcome in a group with an exposure. Attributable risk (Choice B) is the difference in risk between an exposed and an unexposed group. Both are used in a cohort study but not a case-control study. Cohort studies examine a group of patients with a known exposure and determine the risk

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E) Relative risk

Correct Answer: D.

The most appropriate measure of association to report in this study is the odds ratio. This study compares one group of patients with an outcome under study (lung cancer) (cases) against a second matched group without that outcome (controls) and identifies the associated exposure (childhood exposure to secondhand cigarette smoke) within each group. This study design is known as a case-control study. Case-control studies can be conducted in a prospective or retrospective manner but are always observational studies. By grouping patients by outcome and comparing differences in the odds of exposure, case-control studies can detect associations between the exposure and outcome, such as exposure to secondhand cigarette smoke in childhood and the odds of developing lung cancer. This is described statistically as an odds ratio (OR). Two unrelated variables will have an OR of 1.0, whereas positive association between an exposure and an outcome will have an OR greater than 1.0, and negatively associated variables will have an OR less than 1.0. Case-control studies are therefore capable of establishing an association between exposure and outcome, but they do not establish causality.

Incorrect Answers: A, B, C, and E.

Absolute risk (Choice A) is the risk for the study outcome in a group with an exposure. Attributable risk (Choice B) is the difference in risk between an exposed and an unexposed group. Both are used in a cohort study but not a case-control study. Cohort studies examine a group of patients with a known exposure and determine the risk for developing a given disease outcome within the exposed group compared with a control group lacking the known exposure. An analogous cohort study to the described case-control study would involve comparison of a group of children exposed to secondhand cigarette smoke and a group of unexposed children to evaluate the risk for developing lung cancer.

Hazard ratio (Choice C) is used to report outcomes in a survival analysis. It is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of an unexposed group. Unlike an odds ratio, which is cumulative over an entire study, the hazard ratio conveys the risk for a negative outcome during the time of the study.

Relative risk (Choice E) is the appropriate measure of association to report in a cohort study. This study is a case-control study, so an odds ratio is a more appropriate measurement to use.

Educational Objective: Case-control studies group patients according to disease outcome status and analyze the odds of exposure to a particular hazard. The appropriate statistical measure of case-control studies is the odds ratio (OR).

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34. A 2608-g (5-lb 12-oz) newborn is delivered at term to a 32-year-old primigravid woman who received no prenatal care. Examination of the newborn shows generalized hypertonia. Meconium testing for cocaine metabolites is positive. A review of the literature shows that this screening test has a sensitivity of 100% and a true-negative rate of 90%. Which of the following is necessary to calculate the positive predictive value of the test?

A) Incidence of no prenatal care
B) Negative predictive value of the test
C) Prevalence of cocaine use by pregnant women in the community
D) Rate of newborn testing for cocaine
E) Specificity of the test

Correct Answer: C.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Positive predictive value (PPV) and negative predictive value (NPV) are statistical measures that define the proportion of positive test results that are true positives (positive tests in patients who have the condition) and negative test results that are true negatives (negative tests in patients without the condition), respectively. PPV is thus defined as (true positives (TP)) / (TP + false positives (FP)), or the true positive rate, and measures the probability of a patient actually having the disease given a positive test result. NPV is defined as (true negatives (TN)) / (TN + false negatives (FN)), or the true negative rate, and measures the probability of a patient being disease-free given a negative test result. Both PPV and NPV vary with disease prevalence; PPV varies directly with prevalence whereas NPV varies inversely with prevalence; therefore, the prevalence of a disease must also be known in order to calculate the positive predictive value of the test. In this case, the screening test uses meconium testing to identify neonatal exposure to cocaine metabolites. The prevalence of cocaine use by pregnant women in the community is an indicator of neonatal exposure to cocaine metabolites, or the true presence of the condition that the screening test aims to identify. Thus, prevalence of cocaine use by pregnant women in the community is necessary to calculate the PPV of the test.

Incorrect Answers: A, B, D, and E.

Incidence of no prenatal care (Choice A) does not impact the PPV of the test. Instead, the prevalence of cocaine use by pregnant women in the community, which equates to the prevalence of neonatal exposure to cocaine, is necessary for calculating the PPV of the test.

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E) Specificity of the test

Correct Answer: C.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Positive predictive value (PPV) and negative predictive value (NPV) are statistical measures that define the proportion of positive test results that are true positives (positive tests in patients who have the condition) and negative test results that are true negatives (negative tests in patients without the condition), respectively. PPV is thus defined as (true positives (TP)) / (TP + false positives (FP)), or the true positive rate, and measures the probability of a patient actually having the disease given a positive test result. NPV is defined as (true negatives (TN)) / (TN + false negatives (FN)), or the true negative rate, and measures the probability of a patient being disease-free given a negative test result. Both PPV and NPV vary with disease prevalence; PPV varies directly with prevalence whereas NPV varies inversely with prevalence; therefore, the prevalence of a disease must also be known in order to calculate the positive predictive value of the test. In this case, the screening test uses meconium testing to identify neonatal exposure to cocaine metabolites. The prevalence of cocaine use by pregnant women in the community is an indicator of neonatal exposure to cocaine metabolites, or the true presence of the condition that the screening test aims to identify. Thus, prevalence of cocaine use by pregnant women in the community is necessary to calculate the PPV of the test.

Incorrect Answers: A, B, D, and E.

Incidence of no prenatal care (Choice A) does not impact the PPV of the test. Instead, the prevalence of cocaine use by pregnant women in the community, which equates to the prevalence of neonatal exposure to cocaine, is necessary for calculating the PPV of the test.

Negative predictive value of the test (Choice B) also requires the prevalence of a disease to be known in order to be calculated. However, the NPV of a test is not required to calculate the PPV of a test.

The rate of newborn testing for cocaine (Choice D) does not impact the PPV. The PPV is a quality of a test that is independent of the rate at which the test is used.

Specificity of the test (Choice E) is not needed to calculate the positive predictive value of the test. The specificity of a test conveys the proportion of people without the disease who test negative.

Educational Objective: PPV and NPV are statistical measures that define the proportion of positive test results that are true positives and negative test results that are true negatives, respectively. Both PPV and NPV vary with disease prevalence, thus prevalence of the disease of interest must be known to calculate PPV and NPV.

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35. A randomized placebo-controlled trial is initiated to investigate the use of a new medication for the treatment of hypertension. The trial enrolled 1000 men and women ages 40 years and older; these patients are equally randomized to either the new medication or a placebo. The primary outcome was established as cardiovascular death or morbidity. After 1 year, 4.2% of patients taking the new medication experienced the primary outcome as determined by hospital records, compared with 3.4% of patients taking placebo (*P*=.52). The investigators then reanalyze the outcomes for only African American study patients. Of the 250 African American patients in the study, 2.4% of those taking the new medication experienced the primary outcome, compared with 6.0% in the placebo group (*P*=.03). The investigators conclude that the medication is effective only for African American patients. Which of the following is the primary threat to the validity of this conclusion?

A) Inadequate sample size
B) Post hoc analysis
C) Recall bias
D) Sampling bias
E) Volunteer bias

Correct Answer: B.

When conducting an investigation, there are many potential biases or pitfalls that can impact the results and lead the investigators to erroneously reject the null hypothesis. One such pitfall is post hoc analysis, a technique in which statistical analyses are conducted after the data has been collected and seen by investigators. In this case, the original hypothesis tested by the investigators was whether the new medication decreased cardiovascular death or morbidity compared with placebo. The difference in cardiovascular death or morbidity within only African American study participants is an example of post hoc analysis. Because post hoc analyses were not originally included in the statistical methodology of the study, they are subject to bias. Whereas an analysis planned before the study is conducted tests a specific hypothesis, post hoc analysis fits a hypothesis to the data. If enough subgroup analyses are conducted, there is an increased likelihood that at least one analysis will demonstrate statistical significance. This introduces inherent bias because the data can be tested in any way that produces a positive result. While post hoc analysis may in some cases allow patterns in data to be identified that were not predicted by the investigators, in general, analyses performed in this way should be carefully evaluated for validity and may require an additional study to confirm.

Incorrect Answers: A, C, D, and E

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included in the statistical methodology of the study, they are subject to bias. Whereas an analysis planned before the study is conducted tests a specific hypothesis, post hoc analysis fits a hypothesis to the data. If enough subgroup analyses are conducted, there is an increased likelihood that at least one analysis will demonstrate statistical significance. This introduces inherent bias because the data can be tested in any way that produces a positive result. While post hoc analysis may in some cases allow patterns in data to be identified that were not predicted by the investigators, in general, analyses performed in this way should be carefully evaluated for validity and may require an additional study to confirm.

Incorrect Answers: A, C, D, and E.

Inadequate sample size (Choice A) decreases the power of a study to detect a statistically significant difference between the intervention and placebo group. Inadequate sample size increases the likelihood of a type II error occurring or the alternative hypothesis being incorrectly rejected in favor of the null hypothesis. In this case, the alternative hypothesis that the new drug is better than placebo in African American patients has been accepted over the null hypothesis, so this would be considered a type I error if incorrect.

Recall bias (Choice C) occurs when awareness of a disorder impacts a subject's recall of past events. Recall bias commonly confounds retrospective studies such as a case-control study because participants may not accurately represent or recall prior exposures. This study is not subject to recall bias because patient outcomes of cardiovascular death or morbidity are not determined based on self-reporting and the study is prospective.

Sampling bias (Choice D) occurs when certain types of members of the population have a lower or higher probability of being sampled than others based on a number of factors. In this case, sampling bias could occur if patients were recruited for the study from a specialty hypertension clinic, causing an increased number of patients with refractory hypertension to be enrolled in the trial than is representative of the hypertensive population as a whole.

Volunteer bias (Choice E) occurs when patients who volunteer to participate in a study have intrinsic differences from the general population of interest. For example, volunteers may have differences in sociodemographic factors, which may confound the outcome of the study and make the results difficult to generalize to the target population.

Educational Objective: Post hoc analysis is a technique in which statistical analyses are conducted after the data has been collected and seen by investigators. Because post hoc analyses were not originally included in the statistical methodology of the study, they are subject to bias, and thus the results from such analyses should be approached cautiously.

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36. A 37-year-old man comes to the physician because of a 1-week history of pain with swallowing. He received the diagnosis of AIDS 4 years ago, but he has not been able to tolerate highly active antiretroviral therapy. He currently takes trimethoprim-sulfamethoxazole. Vital signs are within normal limits. Examination shows a few white plaques over the pharynx. No other abnormalities are noted. Laboratory studies show a CD4+ T-lymphocyte count of 50/mm^3 (Normal≥500) and a plasma HIV viral load of 50,000 copies/mL. Which of the following is the most appropriate pharmacotherapy?

A) Acyclovir
B) Amphotericin B
C) Ciprofloxacin
D) Fluconazole
E) Foscarnet

Correct Answer: D.

Oral candidiasis demonstrates thick, white plaques on the tongue or buccal mucosa, which can be scraped off with a tongue blade. It may cause dysphagia (trouble swallowing) or odynophagia (pain with swallowing) especially if *Candida* esophagitis is present. It is commonly seen in immunosuppressed individuals, such as this patient with poorly controlled HIV, or patients using a steroid inhaler, which alters the normal oral microbiome and immune environment. It is typically caused by infection with *Candida albicans*, which is a ubiquitous dimorphic fungus that causes a wide spectrum of clinical diseases in immunocompetent hosts, including infections of moist skin folds (intertrigo), vaginal infections, and oral thrush. In patients who are immunocompromised, such as those with HIV/AIDS, neutropenic patients on chemotherapy, or patients with poorly controlled diabetics mellitus, *C. albicans* also causes severe oral candidiasis, esophageal candidiasis, or even invasive fungemia. If oral candidiasis is mild and the patient is immunocompetent, topical antifungals such as nystatin are typically adequate. However, when treating oral candidiasis in an immunocompromised individual, as in this case, the most appropriate initial pharmacotherapy is fluconazole.

Incorrect Answers: A, B, C, and E.

Acyclovir (Choice A) and foscarnet (Choice E) are both antiviral medications. Since this patient has oral candidiasis caused by a yeast infection, neither would be effective. Acyclovir and foscarnet may be used to treat infections caused by herpes simplex virus or cytomegalovirus, which are both common in AIDS patients.

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C) Ciprofloxacin

D) Fluconazole

E) Foscarnet

Correct Answer: D.

Oral candidiasis demonstrates thick, white plaques on the tongue or buccal mucosa, which can be scraped off with a tongue blade. It may cause dysphagia (trouble swallowing) or odynophagia (pain with swallowing) especially if *Candida* esophagitis is present. It is commonly seen in immunosuppressed individuals, such as this patient with poorly controlled HIV, or patients using a steroid inhaler, which alters the normal oral microbiome and immune environment. It is typically caused by infection with *Candida albicans*, which is a ubiquitous dimorphic fungus that causes a wide spectrum of clinical diseases in immunocompetent hosts, including infections of moist skin folds (intertrigo), vaginal infections, and oral thrush. In patients who are immunocompromised, such as those with HIV/AIDS, neutropenic patients on chemotherapy, or patients with poorly controlled diabetics mellitus, *C. albicans* also causes severe oral candidiasis, esophageal candidiasis, or even invasive fungemia. If oral candidiasis is mild and the patient is immunocompetent, topical antifungals such as nystatin are typically adequate. However, when treating oral candidiasis in an immunocompromised individual, as in this case, the most appropriate initial pharmacotherapy is fluconazole.

Incorrect Answers: A, B, C, and E.

Acyclovir (Choice A) and foscarnet (Choice E) are both antiviral medications. Since this patient has oral candidiasis caused by a yeast infection, neither would be effective. Acyclovir and foscarnet may be used to treat infections caused by herpes simplex virus or cytomegalovirus, which are both common in AIDS patients.

Amphotericin B (Choice B) may be used in the treatment of oral candidiasis that is severe and refractory to fluconazole or in the treatment of invasive fungal disease. However, the adverse effect profile of amphotericin B is significantly more hazardous than that of fluconazole, so it is not the best first-line therapy.

Ciprofloxacin (Choice C) is an antibiotic and thus not effective in treating this superficial yeast infection.

Educational Objective: Oral candidiasis demonstrates thick, white plaques on the tongue or buccal mucosa, which can be scraped off with a tongue blade. It may cause dysphagia or odynophagia. It is a common complication of AIDS and other immunocompromising conditions. When treating oral candidiasis in an immunocompromised individual, the most appropriate initial pharmacotherapy is fluconazole.

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37. A 20-year-old man is brought to the physician by his parents because of auditory hallucinations and bizarre behavior over the past year. He recently dropped out of college and moved back home with his parents. He has not attempted to find a job. He says that he has been feeling strange, "like being in a dream," and talks to his great-great-grandfather who died 50 years ago. He was diagnosed with hepatitis A 2 years ago after an episode of jaundice, and he has been treated with thyroxine for hypothyroidism for the past 6 months. His pulse is 68/min, respirations are 10/min, and blood pressure is 100/70 mm Hg. Physical examination shows hyperreflexia of the lower extremities and mild resting tremor of the upper extremities. On mental status examination, his voice is monotonous, his face is immobile, and he seems very anxious. He stares at the physician and barely answers questions. Serum studies show:

Total bilirubin	1 mg/dL
Thyroid-stimulating hormone	1 μU/mL
AST	21 U/L
ALT	20 U/L

Urine toxicology screening is negative. Which of the following is the most likely diagnosis?

A) Amyotrophic lateral sclerosis
B) Bipolar disorder
C) Hepatic encephalopathy
D) Major depressive disorder with psychotic features
E) Parkinson disease
F) Psychotic disorder due to a general medical condition
G) Schizophrenia
H) Substance-induced psychotic disorder

Correct Answer: G.

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B) Bipolar disorder
C) Hepatic encephalopathy
D) Major depressive disorder with psychotic features
E) Parkinson disease
F) Psychotic disorder due to a general medical condition
G) Schizophrenia
H) Substance-induced psychotic disorder

Correct Answer: G.

According to the DSM-5, patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, avolition, alogia). Schizophrenia has been postulated to result from excessive pruning of glutamatergic synapses in the cerebral cortex during critical periods of development. This patient's avolition has likely contributed to his lack of effort in finding a job. Many patients also illustrate prodromal periods of strange behavior and social withdrawal. To meet diagnostic criteria, patients must demonstrate functional deficits, and the total duration of symptoms must exceed 6 months. Antipsychotic medication is the cornerstone of treatment.

Incorrect Answers: A, B, C, D, E, F, and H.

Amyotrophic lateral sclerosis (Choice A) is a progressive neurodegenerative disorder featuring a combination of upper and lower motor neuron weakness patterns. This patient does not demonstrate motor weakness, and his hyperreflexia is likely related to a high-normal thyroid hormone concentration.

Bipolar disorder (Choice B) is characterized by discrete episodes of depression and mania, which can sometimes be accompanied by psychotic symptoms such as hallucinations and delusions. Major depressive disorder with psychotic features (Choice D) includes 2 or more weeks of depressive symptoms (eg, depressive symptoms, neurovegetative symptoms) and psychotic symptoms that occur concurrently. The psychotic symptoms are typically mood congruent (eg, delusions of guilt) and can be conceptualized as secondary to depression. This patient has not demonstrated mood episodes; his psychotic symptoms and behavior changes have been constant and persistent.

Hepatic encephalopathy (Choice C), a sign of liver failure, presents with confusion or stupor along with neurologic symptoms such as cortical blindness, asterixis, tremor

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Amyotrophic lateral sclerosis (Choice A) is a progressive neurodegenerative disorder featuring a combination of upper and lower motor neuron weakness patterns. This patient does not demonstrate motor weakness, and his hyperreflexia is likely related to a high-normal thyroid hormone concentration.

Bipolar disorder (Choice B) is characterized by discrete episodes of depression and mania, which can sometimes be accompanied by psychotic symptoms such as hallucinations and delusions. Major depressive disorder with psychotic features (Choice D) includes 2 or more weeks of depressive symptoms (eg, depressive symptoms, neurovegetative symptoms) and psychotic symptoms that occur concurrently. The psychotic symptoms are typically mood congruent (eg, delusions of guilt) and can be conceptualized as secondary to depression. This patient has not demonstrated mood episodes; his psychotic symptoms and behavior changes have been constant and persistent.

Hepatic encephalopathy (Choice C), a sign of liver failure, presents with confusion or stupor along with neurologic symptoms such as cortical blindness, asterixis, tremor, myoclonus, and frontal release signs. This patient does not have a history of chronic liver disease or risk factors for chronic liver disease and does not demonstrate increased transaminases to indicate acute liver failure.

Parkinson disease (Choice E) is a neurodegenerative disorder that presents with dysfunction of voluntary movements in the form of bradykinesia, resting tremor, rigidity, and postural instability. This patient is likely too young to develop Parkinson disease and demonstrates a range of psychotic symptoms that would be atypical of early Parkinson disease. His facial immobility is likely related to a flat affect.

Psychotic disorder due to a general medical condition (Choice F) refers to psychosis that is a physiologic consequence of a medical condition. Thyrotoxicosis can lead to psychotic symptoms. This patient's hyperreflexia and mild resting tremor are likely related to a high-normal thyroid hormone concentration (given a low-normal TSH concentration). However, this patient started thyroxine after his behavioral changes started, and he lacks other vital signs or physical examination signs that would indicate thyrotoxicosis.

Substance-induced psychotic disorder (Choice H) is defined as the presence of delusions or hallucinations that develop during or within a month of substance use or withdrawal. This patient's urine toxicology is negative for stimulants (a common cause of substance-induced psychosis).

Educational Objective: Patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, avolition, alogia).

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38. A 62-year-old man comes to the physician because of sadness and difficulty sleeping since his wife of 35 years died of breast cancer 7 months ago. He began grieving for her before she died, but the grief has become more intense since her death. During this period, he has had loss of appetite and is no longer interested in golfing and having dinner with friends. He has started to believe that he will never feel better and sees himself as worthless. Physical examination shows no abnormalities. Mental status examination shows a depressed mood and sad affect. He says that life is no longer tolerable, but he has not thought about killing himself. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Adjustment disorder with depressed mood
C) Dysthymic disorder
D) Major depressive disorder
E) Normal bereavement

Correct Answer: D.

Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in previous hobbies or socializing), guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance. These symptoms disrupt everyday functioning. The pathogenesis of MDD involves a genetic vulnerability combined with environmental stressors (eg, the death of a loved one). The most effective treatment includes both psychotherapy and antidepressant medication. All patients with suspected MDD should be screened for suicidal ideation. If a patient endorses suicidal ideation with an active plan, then inpatient psychiatric hospitalization should be strongly considered.

Incorrect Answers: A, B, C, and E.

Acute stress disorder (Choice A) presents with intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient possesses no recent history of trauma and does not demonstrate intrusive thoughts, avoidance symptoms, or changes in arousal.

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Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in previous hobbies or socializing), guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance. These symptoms disrupt everyday functioning. The pathogenesis of MDD involves a genetic vulnerability combined with environmental stressors (eg, the death of a loved one). The most effective treatment includes both psychotherapy and antidepressant medication. All patients with suspected MDD should be screened for suicidal ideation. If a patient endorses suicidal ideation with an active plan, then inpatient psychiatric hospitalization should be strongly considered.

Incorrect Answers: A, B, C, and E.

Acute stress disorder (Choice A) presents with intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient possesses no recent history of trauma and does not demonstrate intrusive thoughts, avoidance symptoms, or changes in arousal.

Adjustment disorder with depressed mood (Choice B) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated depressive symptoms. By definition, patients with adjustment disorder do not experience a sufficient number or duration of depressive symptoms to satisfy MDD criteria.

Dysthymic disorder (Choice C), or persistent depressive disorder, refers to at least three depression symptoms (including depressed mood during more days than not) that have endured for at least 2 years. By definition, patients with persistent depressive disorder do not experience a sufficient number of depressive symptoms to satisfy MDD criteria.

Normal bereavement (Choice E), or uncomplicated grief reaction, presents in diverse ways and can include sadness, shock, anguish, guilt, regret, difficulty concentrating, decreased interest in usual activities, preoccupation with thoughts and memories of the deceased, and neurovegetative symptoms such as sleep, appetite, and energy disturbances. Symptoms typically endure less than 6 months. However, patients with uncomplicated grief reaction do not experience a enough depressive symptoms to satisfy MDD criteria.

Educational Objective: Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance. By definition, patients who satisfy MDD criteria do not meet criteria for uncomplicated grief reaction, adjustment disorder, or persistent depressive disorder.

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39. A 27-year-old man is brought to the emergency department by police 1 hour after they found him lying in the street and proclaiming himself to be invulnerable to death because he is "the Antichrist." He is not able to give a coherent history, but imipramine and thioridazine bottles are found in his pocket. He appears somnolent. His pulse is 88/min, respirations are 20/min, and blood pressure is 110/70 mm Hg. Physical examination shows red, dry skin and dilated pupils. Serum electrolyte concentrations are within the reference ranges. An ECG shows a prolonged QT interval. The patient is admitted to the intensive care unit. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of blood alcohol concentration
B) Measurement of serum imipramine concentration
C) Measurement of urine porphobilinogen concentration
D) MRI of the brain
E) Urine culture

Correct Answer: B.

This patient's presentation is likely a result of intoxication with imipramine, a tricyclic antidepressant. Features of tricyclic antidepressant overdose include confusion, delirium, cardiac arrhythmias, hypotension, and anticholinergic toxicity. Anticholinergic effects can include dry mouth, sedation, constipation, hallucinations, delirium, ataxia, flushed skin, and visual disturbances (cycloplegia). Management includes the administration of sodium bicarbonate to treat the patient's cardiac toxicity (demonstrated in this case by prolonged corrected QT interval) and the administration of intravenous fluids to correct hypotension. The mainstay of treatment for tricyclic antidepressant overdose is sodium bicarbonate to treat the associated cardiac toxicity and prevent further arrhythmias. A broad set of laboratory analyses should be sent to confirm and evaluate the severity of overdose, assess for end-organ dysfunction, and rule out coingestion.

Incorrect Answers: A, C, D, and E.

Measurement of blood alcohol concentration (Choice A) would be helpful in patients presenting with alcohol intoxication, with central nervous system effects such as disorientation and altered mental status. Alcohol intoxication would not cause a prolonged QT interval or signs of anticholinergic toxicity; however, it should be a part of the evaluation in this case because of the need to exclude concomitant coingestion.

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This patient's presentation is likely a result of intoxication with imipramine, a tricyclic antidepressant. Features of tricyclic antidepressant overdose include confusion, delirium, cardiac arrhythmias, hypotension, and anticholinergic toxicity. Anticholinergic effects can include dry mouth, sedation, constipation, hallucinations, delirium, ataxia, flushed skin, and visual disturbances (cycloplegia). Management includes the administration of sodium bicarbonate to treat the patient's cardiac toxicity (demonstrated in this case by prolonged corrected QT interval) and the administration of intravenous fluids to correct hypotension. The mainstay of treatment for tricyclic antidepressant overdose is sodium bicarbonate to treat the associated cardiac toxicity and prevent further arrhythmias. A broad set of laboratory analyses should be sent to confirm and evaluate the severity of overdose, assess for end-organ dysfunction, and rule out coingestion.

Incorrect Answers: A, C, D, and E.

Measurement of blood alcohol concentration (Choice A) would be helpful in patients presenting with alcohol intoxication, with central nervous system effects such as disorientation and altered mental status. Alcohol intoxication would not cause a prolonged QT interval or signs of anticholinergic toxicity; however, it should be a part of the evaluation in this case because of the need to exclude concomitant coingestion.

Decreased activity of porphobilinogen deaminase leading to accumulation of porphobilinogen, δ-ALA, and coporphobilinogen is seen in acute intermittent porphyria. It is characterized by abdominal pain, polyneuropathy, psychological symptoms, and port wine-colored urine. Diagnosis of acute intermittent porphyria involves measurement of urine porphobilinogen concentration (Choice C).

MRI of the brain (Choice D) can support the evaluation of altered mental status when acute ischemic stroke, brain tumor, cerebral infections, or other primary brain causes are suspected. The most likely cause of this patient's delirium is tricyclic antidepressant toxicity; a primary neurologic cause is less likely. In addition, this patient is showing signs of cardiac toxicity and is not stable for a detailed imaging study.

Urine culture (Choice E) would be helpful in the diagnosis of urinary tract infections. This patient's presentation is unlikely to be a result of a urinary tract infection, which would typically present with urinary frequency and dysuria. Urinary tract infections can cause altered mental status in elderly patients and would be unlikely in a young male patient.

Educational Objective: Imipramine, a tricyclic antidepressant, can cause confusion, delirium, cardiac arrhythmias, hypotension, and anticholinergic toxicity in overdose. Measurement of serum imipramine concentration is helpful in diagnosis.

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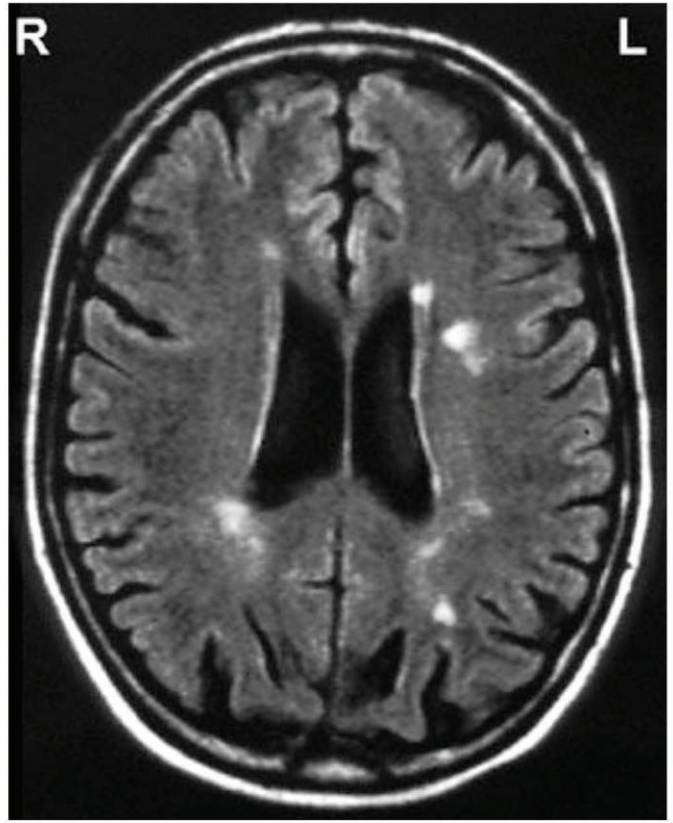
40. A 32-year-old woman comes to the physician because of weakness in her right leg that began 1 week ago and has resolved over the past 24 hours. She is currently asymptomatic. Two years ago, she had tingling in both hands and an "electric-like" sensation down her spine when she flexed her neck; her symptoms resolved after 3 weeks. Six months ago, she had visual loss in her right eye and pain with eye movement. Examination at that time showed a right central scotoma that resolved after 2 weeks. She has a history of mitral valve prolapse. She takes no medications. Her pulse is 64/min and regular, and blood pressure is 100/60 mm Hg. Cardiac examination shows a systolic click. Funduscopic examination shows mild pallor of the right optic disc; there is no afferent pupillary defect. Muscle strength is normal. Deep tendon reflexes are 2+ in the upper extremities and 3+ in the lower extremities. Babinski sign is present on the right. An MRI of the brain is shown. Which of the following is the most appropriate treatment for this patient?



A) Stress management
B) Amitriptyline therapy
C) Aspirin therapy
D) Dexamethasone therapy
E) Interferon beta therapy
F) Propranolol therapy
G) Warfarin therapy
H) Radiation therapy

Correct Answer: E.

Multiple sclerosis (MS), the most prevalent immune-mediated demyelinating disease, typically presents with episodic neurologic dysfunction. According to the McDonald criteria for MS diagnosis, patients must have evidence of demyelinating lesions that are separated in time and location. This evidence is typically based on subjective symptoms and radiologic studies. This patient's lower extremity weakness (likely secondary to corticospinal tract pathology), bilateral upper extremity paresthesia

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H) Radiation therapy

Correct Answer: E.

Multiple sclerosis (MS), the most prevalent immune-mediated demyelinating disease, typically presents with episodic neurologic dysfunction. According to the McDonald criteria for MS diagnosis, patients must have evidence of demyelinating lesions that are separated in time and location. This evidence is typically based on subjective symptoms and radiologic studies. This patient's lower extremity weakness (likely secondary to corticospinal tract pathology), bilateral upper extremity paresthesia (secondary to involvement of sensory tracts), and vision loss and pain (secondary to optic neuritis) are separated in space and time. Optic neuritis is a classic manifestation of MS and is characterized by a central scotoma, afferent pupillary defect, and pale optic disc on examination (which may resolve after the acute episode). Lhermitte sign refers to a transient sensation of electric shock triggered by neck flexion, which is a common sign in MS hypothesized to result from spinal cord inflammation. MRI typically shows white matter hyperintensities in the periventricular region, cortex, subcortical region, cerebellum, or spine. Oligoclonal bands of immunoglobulins, indicating immune overactivation, can be found in the cerebrospinal fluid but are not necessary for diagnosis. Treatment includes corticosteroids for symptomatic management of acute flares and long-term disease-modifying treatments such as interferon beta therapy or monoclonal antibodies. The interferons downregulate immune activity and thereby decrease disease severity and relapse frequency.

Incorrect Answers: A, B, C, D, F, G, and H.

Stress management (Choice A) strategies include regular exercise, a healthy diet, enjoyable activities throughout the day, and sufficient sleep. These strategies can be used by anyone experiencing stress, including patients with MS, and may slightly improve a patient's MS course. However, disease-modifying treatments such as interferon beta have been proven to significantly alter a patient's disease course.

Amitriptyline therapy (Choice B) is a tricyclic antidepressant used to treat depression and neuropathic pain. Though patients with MS who experience depression and pain may benefit from amitriptyline, this patient does not endorse depression or pain.

Aspirin therapy (Choice C) is used in acute stroke management and secondary prevention of stroke. However, this young patient does not possess stroke risk factors. Further, focal neurologic deficits secondary to stroke are typically permanent and constant rather than episodic.

Dexamethasone therapy (Choice D) is a glucocorticoid used for symptomatic management of MS flares. However, this patient's acute flare has resolved.

Propranolol therapy (Choice F) is used for performance anxiety and traumatic brain injury-related agitation. It is not commonly used in MS.

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symptomatic management of acute flares and long-term disease-modifying treatments such as interferon beta therapy or monoclonal antibodies. The interferons downregulate immune activity and thereby decrease disease severity and relapse frequency.

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Amitriptyline therapy (Choice B) is a tricyclic antidepressant used to treat depression and neuropathic pain. Though patients with MS who experience depression and pain may benefit from amitriptyline, this patient does not endorse depression or pain.

Aspirin therapy (Choice C) is used in acute stroke management and secondary prevention of stroke. However, this young patient does not possess stroke risk factors. Further, focal neurologic deficits secondary to stroke are typically permanent and constant rather than episodic.

Dexamethasone therapy (Choice D) is a glucocorticoid used for symptomatic management of MS flares. However, this patient's acute flare has resolved.

Propranolol therapy (Choice F) is used for performance anxiety and traumatic brain injury-related agitation. It is not commonly used in MS.

Warfarin therapy (Choice G) is an anticoagulant medication used in acute management and secondary prevention of thrombotic events in patients with mechanical heart valves or atrial fibrillation. It plays no role in MS or mitral valve prolapse management.

Radiation therapy (Choice H) is commonly used for central nervous system (CNS) malignancy. However, the focal neurologic deficits associated with CNS malignancy are typically permanent and constant rather than episodic. As well, malignancy commonly manifests with constitutional symptoms such as weight loss.

Educational Objective: Multiple sclerosis is an autoimmune demyelinating disease that typically presents with episodic focal neurologic deficits separated in space and time. Treatment includes corticosteroids for symptomatic management of acute flares and long-term disease-modifying treatments such as interferon beta therapy or monoclonal antibodies.

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41. A 77-year-old man with hypertension comes to the physician for a routine examination. His medications are metoprolol and simvastatin. His father died of a cerebral infarction. The patient smoked one pack of cigarettes daily for 25 years but quit 10 years ago. He walks 2 miles daily. He is 180 cm (5 ft 11 in) tall and weighs 82 kg (180 lb); BMI is 25 kg/m^2. His pulse is 70/min, and blood pressure is 140/90 mm Hg. Examination shows no abnormalities. Serum studies show a cholesterol concentration of 210 mg/dL. Results of a recent cardiac stress test are negative. Which of the following is the strongest predisposing factor for cerebral infarction in this patient during the next 5 years?

A) Age
B) Family history
C) Hyperlipidemia
D) Lack of antiplatelet therapy
E) Smoking history

Correct Answer: A.

Cerebral infarctions, or strokes, occur as a result of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic because of blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Risk factors for stroke include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Hypertension is the strongest modifiable risk factor, and age is the strongest nonmodifiable risk factor. For every decade after age 55 years, a patient's stroke risk roughly doubles. Stroke prevention strategies include smoking cessation, regular aerobic exercise, decreasing blood pressure, and decreasing cholesterol concentrations.

Incorrect Answers: B, C, D, and E.

Family history (Choice B) is an important nonmodifiable risk factor. However, it is not as strongly associated with stroke risk as age.

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B) Family history
C) Hyperlipidemia
D) Lack of antiplatelet therapy
E) Smoking history

Correct Answer: A.

Cerebral infarctions, or strokes, occur as a result of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic because of blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Risk factors for stroke include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Hypertension is the strongest modifiable risk factor, and age is the strongest nonmodifiable risk factor. For every decade after age 55 years, a patient's stroke risk roughly doubles. Stroke prevention strategies include smoking cessation, regular aerobic exercise, decreasing blood pressure, and decreasing cholesterol concentrations.

Incorrect Answers: B, C, D, and E.

Family history (Choice B) is an important nonmodifiable risk factor. However, it is not as strongly associated with stroke risk as age.

Hyperlipidemia (Choice C) and smoking (Choice E) are important modifiable risk factors. However, they are not as strongly associated with stroke risk as age. As well, this patient's hyperlipidemia is mild, and his discontinuation of smoking has improved his stroke risk compared with when he was actively smoking.

Lack of antiplatelet therapy (Choice D) is unlikely to play a large role in this patient's stroke risk. Though aspirin's role in secondary prevention of recurrent transient ischemic attacks or strokes is established, its use in primary stroke prevention is unclear.

Educational Objective: Strokes occur as a result of ischemic or hemorrhagic loss of blood supply to the brain. Hypertension is the strongest modifiable risk factor, and age is the strongest nonmodifiable risk factor.

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42. A 57-year-old man comes to the physician because of a 10-year history of an intermittent rash on his face. The rash worsens with cold weather and stress. Examination shows a scaly, erythematous rash in several areas around the nose and eyebrows. There is dandruff from the scalp. Which of the following is the most likely diagnosis?

A) Acne rosacea
B) Acne vulgaris
C) Herpesvirus infection
D) Psoriasis
E) Seborrheic dermatitis

Correct Answer: E.

Seborrheic dermatitis is an inflammatory skin condition caused by overgrowth of the yeast *Malassezia*. *Malassezia* preferentially grows in areas of the body which are sebaceous, or greasy. In adults, it typically presents as erythematous, greasy patches with yellow scale along the sides of the nose, in the eyebrows, along the ears and beard area, and in the scalp (dandruff). In infants, it preferentially affects the scalp and is known as “cradle cap.” When extensive, it may also involve the upper chest and upper back. An abrupt eruption of seborrheic dermatitis may herald HIV infection. Treatment is with topical antifungals such as ketoconazole cream or shampoo. Over-the-counter shampoos containing selenium sulfide or zinc pyrithione are also effective.

Incorrect Answers: A, B, C, and D.

Acne rosacea (Choice A) is a common condition seen in adults that presents with scattered erythematous papules and pustules on the forehead, cheeks, and chin. Unlike acne vulgaris, comedones are not present. The pathogenesis is not definitively known, but factors include vascular dysfunction, impairment of the innate immune system, inflammatory reactions to Demodex mites present on the skin, and sun damage. Scaly rash in a seborrheic distribution is more suggestive of seborrheic dermatitis.

Acne vulgaris (Choice B) causes scattered comedones, papules, pustules, and nodules to form on the face, upper chest, and upper back. A distribution of scaly rash around the nose and eyebrows is more consistent with seborrheic dermatitis.

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D) Psoriasis

E) Seborrheic dermatitis

Correct Answer: E.

Seborrheic dermatitis is an inflammatory skin condition caused by overgrowth of the yeast *Malassezia*. *Malassezia* preferentially grows in areas of the body which are sebaceous, or greasy. In adults, it typically presents as erythematous, greasy patches with yellow scale along the sides of the nose, in the eyebrows, along the ears and beard area, and in the scalp (dandruff). In infants, it preferentially affects the scalp and is known as “cradle cap.” When extensive, it may also involve the upper chest and upper back. An abrupt eruption of seborrheic dermatitis may herald HIV infection. Treatment is with topical antifungals such as ketoconazole cream or shampoo. Over-the-counter shampoos containing selenium sulfide or zinc pyrithione are also effective.

Incorrect Answers: A, B, C, and D.

Acne rosacea (Choice A) is a common condition seen in adults that presents with scattered erythematous papules and pustules on the forehead, cheeks, and chin. Unlike acne vulgaris, comedones are not present. The pathogenesis is not definitively known, but factors include vascular dysfunction, impairment of the innate immune system, inflammatory reactions to Demodex mites present on the skin, and sun damage. Scaly rash in a seborrheic distribution is more suggestive of seborrheic dermatitis.

Acne vulgaris (Choice B) causes scattered comedones, papules, pustules, and nodules to form on the face, upper chest, and upper back. A distribution of scaly rash around the nose and eyebrows is more consistent with seborrheic dermatitis.

Herpesvirus infection (Choice C) causes clear vesicles, which progress to punched out ulcers. A scaly rash is not consistent with herpesvirus infection.

Psoriasis (Choice D) also presents as scaly, erythematous plaques. However, psoriasis does not typically involve the face in adult patients and the scale is silvery rather than yellow and greasy. When it does involve the face, it does not necessarily include seborrheic areas such as the sides of the nose or around the eyebrows. Most often, psoriasis involves the extensor extremities.

Educational Objective: An overgrowth of the yeast *Malassezia* causes seborrheic dermatitis. In adults, it typically presents as erythematous, greasy patches with yellow scale in a seborrheic distribution, such as along the sides of the nose, in the eyebrows, along the ears and beard area, and in the scalp (dandruff). In infants, it preferentially affects the scalp and is known as “cradle cap.”

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43. A 67-year-old man comes to the physician 1 hour after a 5-minute episode of moderate left-sided chest pain that began while he was unloading groceries. The pain radiated to the left jaw. During the past 3 months, he also has had progressive shortness of breath when lying down. He has a 1-year history of decreasing stamina; he now often has to stop and rest while taking out the trash. He has well-controlled hypertension, well-controlled type 2 diabetes mellitus, and chronic bronchitis. His medications are hydrochlorothiazide, metoprolol, glipizide, and a nebulized albuterol inhaler as needed. He smoked one and one-half packs of cigarettes daily for 40 years but quit 10 years ago. His temperature is 37.2°C (99°F), pulse is 100/min, respirations are 16/min, and blood pressure is 100/58 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. Examination shows jugular venous distention. Crackles are heard at both lung bases. On cardiac examination, there is an S_3 and a grade 2/6 harsh, late-peaking, systolic murmur heard best at the upper right sternal border. There is 2+ pitting edema of the lower legs. Which of the following is the most appropriate next step in diagnosis?

A) Coronary angiography
B) Echocardiography
C) Exercise stress test
D) MR aortography
E) Spiral CT scan of the chest

Correct Answer: B.

The patient is presenting with signs and symptoms of new decompensated heart failure with increased jugular venous distention, peripheral edema, and pulmonary crackles in the setting of progressive symptoms over the past year (decreased exercise tolerance and orthopnea). Appropriate management is dependent on identifying the underlying cause of the heart failure. The major causes of new-onset decompensated heart failure include acute coronary syndrome, myocarditis, acute or progressive valvulopathy, toxin- and stress-induced cardiomyopathy, and hypertensive crisis. Initial work-up should focus on evaluating for these causes, with routine laboratory testing, cardiac biomarkers, ECG, chest x-ray, and echocardiography. The presence of a late-peaking, systolic murmur heard best at the upper right sternal border in the setting of symptoms that have been worsening over the past year is concerning for progressive aortic stenosis, which is best evaluated with echocardiography.

Incorrect Answers: A, C, D, and E.

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E) Spiral CT scan of the chest

Correct Answer: B.

The patient is presenting with signs and symptoms of new decompensated heart failure with increased jugular venous distention, peripheral edema, and pulmonary crackles in the setting of progressive symptoms over the past year (decreased exercise tolerance and orthopnea). Appropriate management is dependent on identifying the underlying cause of the heart failure. The major causes of new-onset decompensated heart failure include acute coronary syndrome, myocarditis, acute or progressive valvulopathy, toxin- and stress-induced cardiomyopathy, and hypertensive crisis. Initial work-up should focus on evaluating for these causes, with routine laboratory testing, cardiac biomarkers, ECG, chest x-ray, and echocardiography. The presence of a late-peaking, systolic murmur heard best at the upper right sternal border in the setting of symptoms that have been worsening over the past year is concerning for progressive aortic stenosis, which is best evaluated with echocardiography.

Incorrect Answers: A, C, D, and E.

Coronary angiography (Choice A) may be indicated if acute coronary syndrome is identified as the cause of the patient's presentation. He has multiple risk factors for coronary artery disease, and the report of angina that came on with exertion is highly concerning. There is not yet enough information available to proceed to cardiac catheterization, but if cardiac biomarkers are increased and the ECG shows ST segment changes or other evidence of ischemia, the patient should undergo coronary arteriography and potential revascularization.

Exercise stress test (Choice C) should not be performed in the acute setting. The patient requires more urgent work-up of his decompensated heart failure. Exercise stress testing is contraindicated in the setting of symptomatic aortic stenosis and unstable angina, and pharmacologic stress testing should be used instead.

MR aortography (Choice D) is the gold standard for imaging diagnosis of aortic dissection, though other modalities are preferred in hemodynamically unstable patients. Aortic dissection classically presents as tearing chest or abdominal pain radiating to the back, often with a peripheral pulse or blood pressure deficit.

Spiral CT scan of the chest (Choice E) is used to evaluate for pulmonary embolism. Pulmonary embolism typically presents with acute chest pain, shortness of breath, and hypoxemia, often in a patient with deep venous thrombosis or a known hypercoagulable state.

Educational Objective: Patients presenting with new-onset acute decompensated heart failure should be stabilized and undergo work-up to identify the underlying cause. Initial high-yield studies include routine laboratory testing, cardiac biomarkers, ECG, chest x-ray, and echocardiography.

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44. A 27-year-old man is brought to the emergency department 50 minutes after he sustained a gunshot wound to his right leg. He was injured while attempting to flee a crime scene. Paramedics report significant bright red bleeding that was controlled with pressure dressings at the scene. On arrival, the patient is conscious and responsive. His pulse is 100/min and regular, respirations are 18/min, and blood pressure is 100/85 mm Hg. Examination shows a single gunshot entry and exit wound in the right thigh with moderate oozing of bright red and dark blood but no pulsatile bleeding. The mid thigh is edematous. The right femoral pulse is palpable; no popliteal or pedal pulses are palpable. The right ankle brachial index is 0.5 (N>1) at the dorsalis pedis. The remainder of the examination shows no abnormalities. In addition to intravenous fluid administration, which of the following is the most appropriate next step in management?

A) Arterial ligation
B) CT scan of the right lower extremity
C) Endovascular stent placement
D) Intraoperative angiography
E) Intravenous administration of heparin

Correct Answer: D.

The patient has suffered a severe lower extremity injury secondary to penetrating trauma with evidence of vascular injury and hemodynamic instability. The patient is at risk for acute limb ischemia, loss of the extremity, and hemorrhagic shock, and he should undergo immediate evaluation in the operating room with intraoperative angiography to identify and repair the site of vascular injury. Penetrating and blunt trauma can compromise blood flow because of direct mechanical disruption of the vessel, thrombosis or thromboembolism, or development of compartment syndrome. In this case, the report of bright red bleeding at the scene, an edematous thigh, and the absence of popliteal and pedal pulses with a severely decreased ankle-brachial index argue for a direct arterial injury. The presence of tachycardia and hypotension with continued oozing of blood are concerning for current active hemorrhage. Timely evaluation and intervention in the operating room is required.

Incorrect Answers: A, B, C, and E.

Arterial ligation (Choice A) and endovascular stent placement (Choice C) are surgical management options for severe extremity trauma with vascular injury. Arterial ligation is a damage control strategy for exsanguination that risks loss of the limb and need for amputation or additional attempts at revascularization. The extent and location of

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C) Endovascular stent placement

D) Intraoperative angiography

E) Intravenous administration of heparin

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Arterial ligation (Choice A) and endovascular stent placement (Choice C) are surgical management options for severe extremity trauma with vascular injury. Arterial ligation is a damage control strategy for exsanguination that risks loss of the limb and need for amputation or additional attempts at revascularization. The extent and location of injury should be determined first with intraoperative angiography.

CT scan of the right lower extremity (Choice B) would be appropriate to evaluate for injury to bone and soft tissue and for retained bullet fragments if there was minimal concern for vascular injury or active bleeding. An unstable patient with signs of acute limb ischemia should bypass the radiology department for the operating room.

Intravenous administration of heparin (Choice E) is contraindicated in this patient with a traumatic penetrating injury to the extremity and active bleeding. In other clinical situations, arterial thromboembolic disease is on the differential for acute limb ischemia and anticoagulation may be warranted.

Educational Objective: Acute limb ischemia is a medical emergency characterized by pain, pallor, absent distal pulses, poikilothermia, paresthesia, and paralysis as injury to the limb progresses. Trauma can cause acute limb ischemia through mechanical disruption of arterial vessels. Unstable patients should be evaluated in the operating room for timely diagnosis and intervention.

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45. A 33-year-old woman, gravida 2, para 1, at 35 weeks' gestation is admitted to the hospital because of a 1-hour history of moderate, bright red vaginal bleeding. During this time, she has saturated two sanitary pads. She has not felt contractions or loss of amniotic fluid and reports good fetal movement. She has received no prenatal care. Her first pregnancy ended in cesarean delivery at term because of fetal bradycardia. She is unemployed and lives in a local homeless shelter. She has a history of cocaine use but has not used cocaine during the past 2 months. Her temperature is 37°C (98.6°F), pulse is 100/min and regular, and blood pressure is 90/60 mm Hg. The abdomen is nontender and consistent in size with a 35-week gestation. External fetal monitoring shows a heart rate of 150/min with moderate variability, several spontaneous accelerations, and occasional variable decelerations. An external tocometer shows irregular uterine contractions. Examination shows a small amount of bright red blood at the perineum. Which of the following is the most appropriate next step in management?

A) Apt test
B) Contraction stress test
C) Digital cervical examination
D) Immediate cesarean delivery
E) Pelvic ultrasonography

Correct Answer: E.

Placenta previa refers to the abnormal positioning of placental tissue such that the placenta partially or completely overlies the internal cervical os. Its most common presenting symptom is third trimester painless vaginal bleeding. Placenta previa is usually detected on routine prenatal ultrasonography in patients who receive prenatal care. Risk factors for placenta previa include causes of uterine scarring, such as multiparity, previous cesarean delivery, and prior dilation and curettage. When detected early, the condition often self-resolves as the pregnancy progresses and the placenta migrates away from the os. However, if placenta previa persists into the third trimester and to the time of labor, cesarean delivery is indicated to prevent significant hemorrhage, maternal/fetal complications, and potential fetal demise. It is also important in these patients to avoid digital cervical examination, because it can disrupt the placental bed and cause significant hemorrhage. Diagnosis occurs through ultrasonography.

Incorrect Answers: A, B, C, and D.

Apt test (Choice A) is a test used to differentiate maternal blood from fetal blood when the source is unclear. It is most commonly used to evaluate maternal vaginal blood

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Placenta previa refers to the abnormal positioning of placental tissue such that the placenta partially or completely overlies the internal cervical os. Its most common presenting symptom is third trimester painless vaginal bleeding. Placenta previa is usually detected on routine prenatal ultrasonography in patients who receive prenatal care. Risk factors for placenta previa include causes of uterine scarring, such as multiparity, previous cesarean delivery, and prior dilation and curettage. When detected early, the condition often self-resolves as the pregnancy progresses and the placenta migrates away from the os. However, if placenta previa persists into the third trimester and to the time of labor, cesarean delivery is indicated to prevent significant hemorrhage, maternal/fetal complications, and potential fetal demise. It is also important in these patients to avoid digital cervical examination, because it can disrupt the placental bed and cause significant hemorrhage. Diagnosis occurs through ultrasonography.

Incorrect Answers: A, B, C, and D.

Apt test (Choice A) is a test used to differentiate maternal blood from fetal blood when the source is unclear. It is most commonly used to evaluate maternal vaginal blood and blood in fetal stool or emesis. It can be used to evaluate vaginal bleeding during pregnancy, but use is limited in the evaluation of placenta or vasa previa since the mother and fetus may decompensate before the test results.

Contraction stress test (Choice B) is used to evaluate fetal response to stress and is done by inducing contractions in a mother and then monitoring the fetal heart rate. It is commonly used in pregnancies that are complicated by conditions that put the fetus at increased risk for hypoxemia, such as maternal diabetes or preeclampsia. It is contraindicated in placenta or vasa previa, since contractions can lead to worsening fetomaternal hemorrhage.

Digital cervical examination (Choice C) is contraindicated in placenta or vasa previa. Manipulation of the cervix can cause worsening fetomaternal hemorrhage, so ultrasonography should be completed first to determine whether an overlying placenta/vessel is present.

Immediate cesarean delivery (Choice D) should not be pursued until the diagnosis is confirmed. While cesarean delivery is recommended for placenta or vasa previa, its presence should first be confirmed with pelvic ultrasonography.

Educational Objective: Placenta previa is the implantation of the placenta over the cervical os and presents with painless vaginal bleeding in the third trimester. Risk factors include multiparity, previous cesarean delivery, and history of dilation and curettage. Digital cervical examination should be avoided, with pelvic ultrasonography as the first step in evaluation. Cesarean delivery is required to prevent fetal and maternal morbidity and mortality.

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46. A 3-year-old girl is admitted to the hospital because of a 7-day history of fever and irritability. Treatment with acetaminophen has not resolved her symptoms. During the past 2 days, she has had a decreased appetite but a normal fluid intake. She appears irritable. Her temperature is 38.7°C (101.7°F). Examination shows nontender, bilateral, cervical lymphadenopathy. The sclerae are injected without exudates. There is an erythematous papular rash over the perineum. Examination of the hands and feet shows erythema and tenderness. Her hemoglobin concentration is 10.2 g/dL, and platelet count is 285,000/mm^3. Urinalysis shows 50 WBC/hpf and no bacteria. Which of the following is the most appropriate pharmacotherapy?

A) Oral ibuprofen
B) Oral warfarin
C) Intramuscular penicillin
D) Intravenous immune globulin
E) Intravenous prednisone

Correct Answer: D.

Mucocutaneous lymph node syndrome (Kawasaki disease) is a multisystem vasculitic disease in children characterized by fever for at least 5 days, bilateral nonexudative conjunctivitis, a polymorphous rash, lymphadenopathy, erythema and edema of the hands and feet, and erythema affecting the mucous membranes with dry, cracked lips. To diagnose Kawasaki disease, fever for 5 days or more plus four of the remaining criteria are required. Laboratory evaluation may show thrombocytosis and increased erythrocyte sedimentation rate. Complications of Kawasaki disease include coronary artery aneurysms and, if untreated, can lead to aneurysmal expansion, rupture, or myocardial infarction. Therefore, children suspected of having Kawasaki disease require immediate evaluation with electrocardiography and echocardiography, treatment, and monitoring for progression or complications. Treatment of Kawasaki disease involves high-dose aspirin and intravenous immunoglobulin and is the only widely accepted indication for aspirin use in febrile children because of the risk for Reye syndrome. Kawasaki disease is one of the most common childhood vasculitides and a common cause of pediatric heart disease.

Incorrect Answers: A, B, C, and E.

Oral ibuprofen (Choice A) is a nonsteroidal anti-inflammatory drug that would be appropriate for children with fever and viral illness who are well-appearing without

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Correct Answer: D.

Mucocutaneous lymph node syndrome (Kawasaki disease) is a multisystem vasculitic disease in children characterized by fever for at least 5 days, bilateral nonexudative conjunctivitis, a polymorphous rash, lymphadenopathy, erythema and edema of the hands and feet, and erythema affecting the mucous membranes with dry, cracked lips. To diagnose Kawasaki disease, fever for 5 days or more plus four of the remaining criteria are required. Laboratory evaluation may show thrombocytosis and increased erythrocyte sedimentation rate. Complications of Kawasaki disease include coronary artery aneurysms and, if untreated, can lead to aneurysmal expansion, rupture, or myocardial infarction. Therefore, children suspected of having Kawasaki disease require immediate evaluation with electrocardiography and echocardiography, treatment, and monitoring for progression or complications. Treatment of Kawasaki disease involves high-dose aspirin and intravenous immunoglobulin and is the only widely accepted indication for aspirin use in febrile children because of the risk for Reye syndrome. Kawasaki disease is one of the most common childhood vasculitides and a common cause of pediatric heart disease.

Incorrect Answers: A, B, C, and E.

Oral ibuprofen (Choice A) is a nonsteroidal anti-inflammatory drug that would be appropriate for children with fever and viral illness who are well-appearing without suspicion for serious bacterial illness or Kawasaki disease.

Oral warfarin (Choice B) is an anticoagulant medication that is used in the treatment of deep venous thrombosis and pulmonary embolism, as well as prevention against thromboembolic disease in high-risk patients with atrial fibrillation.

Intramuscular penicillin (Choice C) can be used as treatment for primary syphilis or group A streptococcal pharyngitis. Streptococcal pharyngitis can present with fever, lymphadenopathy, sore throat, and enlarged tonsils with exudate. This patient's presentation is more consistent with Kawasaki disease.

Intravenous prednisone (Choice E) can be used in the treatment and management of Kawasaki disease, but it has shown variable benefit and would only be used as an adjunct to the first-line treatment of Kawasaki disease, intravenous immunoglobulin and aspirin.

Educational Objective: Kawasaki disease is a multisystem vasculitic disease in children characterized by fever for at least 5 days, bilateral nonexudative conjunctivitis, a polymorphous rash, lymphadenopathy, erythema and edema of the hands and feet, and erythema affecting the mucous membranes with dry, cracked lips. Treatment of Kawasaki disease involves high-dose aspirin and intravenous immunoglobulin.

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47. An 87-year-old woman with metastatic ovarian cancer has poorly controlled pain. Her cancer has been unresponsive to chemotherapy. Current medications include long-acting oral morphine, short-acting morphine as needed, and docusate. Her family is having difficulty caring for her at home. The patient's oldest daughter calls the physician to discuss her mother's care. She says, "We want my mother to receive hospice care at home, but no one wants her to die at home. Can she still have hospice services?" Which of the following is the most appropriate response?

A) "No, but we can try to arrange for some other type of home service."
B) "No. It is important that hospice patients die at home."
C) "No. The patient cannot be enrolled in the hospice program if the patient or family prefer that death not take place at home."
D) "Yes, but we would have to transfer her to a nursing home to enroll her in the hospice program."
E) "Yes. Hospice can provide home-based care and attempt to transfer the patient to another site before death."

Correct Answer: E.

Hospice care is a model of health care that prioritizes quality of life over prolongation of life, emphasizing the palliation of physical, emotional, and spiritual pain. Measures that prolong life without enhancing quality of life (eg, invasive procedures) are incompatible with the hospice care model. Hospice care is a flexible model that can be delivered at home, in an assisted living facility, in a nursing home, in a hospice facility, at the hospital, or at a combination of these locations. The setting of hospice care depends on the preferences of the patient and their family and may involve different locations for care delivery and death. Based on models of healthcare reimbursement in the United States, patients eligible for hospice care typically possess a terminal illness from which they are expected to die within 6 months. The decision to pursue hospice care should be made by the patient or others who know the patient well based on the patient's values and/or stated wishes.

Incorrect Answers: A, B, C, and D.

Statements that hospice care cannot accommodate a transfer to a different facility for death if delivered from home (Choices A and C) are inaccurate. The hospice care model can accommodate a variety of patient preferences, including a different location for care delivery and death.

The statement that hospice patients should die at home (Choice B) is inaccurate. According to patient autonomy, the patient and family should decide their preferred

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A) "No, but we can try to arrange for some other type of home service."
B) "No. It is important that hospice patients die at home."
C) "No. The patient cannot be enrolled in the hospice program if the patient or family prefer that death not take place at home."
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Hospice care is a model of health care that prioritizes quality of life over prolongation of life, emphasizing the palliation of physical, emotional, and spiritual pain. Measures that prolong life without enhancing quality of life (eg, invasive procedures) are incompatible with the hospice care model. Hospice care is a flexible model that can be delivered at home, in an assisted living facility, in a nursing home, in a hospice facility, at the hospital, or at a combination of these locations. The setting of hospice care depends on the preferences of the patient and their family and may involve different locations for care delivery and death. Based on models of healthcare reimbursement in the United States, patients eligible for hospice care typically possess a terminal illness from which they are expected to die within 6 months. The decision to pursue hospice care should be made by the patient or others who know the patient well based on the patient's values and/or stated wishes.

Incorrect Answers: A, B, C, and D.

Statements that hospice care cannot accommodate a transfer to a different facility for death if delivered from home (Choices A and C) are inaccurate. The hospice care model can accommodate a variety of patient preferences, including a different location for care delivery and death.

The statement that hospice patients should die at home (Choice B) is inaccurate. According to patient autonomy, the patient and family should decide their preferred location of hospice care delivery based on their wishes and values.

The statement that hospice care must be delivered from a nursing home (Choice D) is inaccurate. Hospice care can be delivered in a variety of locations.

Educational Objective: Hospice care is a model of health care that prioritizes quality of life over prolongation of life. Hospice care is a flexible model that can be delivered in various settings or combinations of settings depending on the preferences of the patient and their family.

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48. Two days before undergoing removal of four molar teeth, a 27-year-old man comes to the physician for therapy to prevent excessive bleeding. He has a lifelong history of mild mucosal bleeding. His sister has a history of similar bleeding. Examination shows no abnormalities. Laboratory studies show:

Platelet count	225,000/mm^3
Bleeding time	11 min
Prothrombin time	11 sec (INR=1)
Partial thromboplastin time	47 sec
Factor VIII	15% of normal (reference range: 50%–150% of normal)

Which of the following is the most likely explanation for these findings?

A) Antiphospholipid antibody syndrome
B) Hemophilia A
C) Inhibitor to factor VIII
D) Lupus anticoagulant
E) von Willebrand disease

Correct Answer: E.

Von Willebrand disease is the most likely diagnosis in this patient with a personal and family history of mucosal bleeding in the setting of normal platelet count and prothrombin time but a decreased concentration of factor VIII and increased bleeding time. Von Willebrand disease is one of the most common hereditary bleeding disorders and is a result of quantitative or qualitative abnormalities of von Willebrand factor (vWF), which binds platelets and subendothelial collagen in primary hemostasis. Impaired platelet adherence to the subendothelial lining, typically mediated by vWF, leads to a prolonged bleeding time. vWF also transports factor VIII in plasma, which degrades rapidly when unbound. Factor VIII is a critical component of the intrinsic coagulation pathway, and decreased concentrations can occasionally lead to a prolonged partial thromboplastin time (PTT), although they can also be normal. Von Willebrand disease is inherited in an autosomal dominant pattern. It can present with epistaxis, gingival bleeding, petechiae, easy bruising, and menorrhagia. Additional diagnostic testing can be performed with the ristocetin cofactor assay, which requires functional vWF for platelet aggregation to occur. Treatment depends on the site and severity of bleeding and may include desmopressin (which promotes

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E) von Willebrand disease

Correct Answer: E.

Von Willebrand disease is the most likely diagnosis in this patient with a personal and family history of mucosal bleeding in the setting of normal platelet count and prothrombin time but a decreased concentration of factor VIII and increased bleeding time. Von Willebrand disease is one of the most common hereditary bleeding disorders and is a result of quantitative or qualitative abnormalities of von Willebrand factor (vWF), which binds platelets and subendothelial collagen in primary hemostasis. Impaired platelet adherence to the subendothelial lining, typically mediated by vWF, leads to a prolonged bleeding time. vWF also transports factor VIII in plasma, which degrades rapidly when unbound. Factor VIII is a critical component of the intrinsic coagulation pathway, and decreased concentrations can occasionally lead to a prolonged partial thromboplastin time (PTT), although they can also be normal. Von Willebrand disease is inherited in an autosomal dominant pattern. It can present with epistaxis, gingival bleeding, petechiae, easy bruising, and menorrhagia. Additional diagnostic testing can be performed with the ristocetin cofactor assay, which requires functional vWF for platelet aggregation to occur. Treatment depends on the site and severity of bleeding and may include desmopressin (which promotes release of additional vWF from endothelial cells) or vWF concentrates. These can be given prior to procedures to limit blood loss.

Incorrect Answers: A, B, C, and D.

Antiphospholipid antibody syndrome (Choice A), an autoimmune disorder that can be primary or secondary to an additional autoimmune disorder (eg, systemic lupus erythematosus), often presents with recurrent miscarriages along with arterial or venous thromboembolic disease, not with bleeding symptoms. Lupus anticoagulant (Choice D) is one of the antibodies frequently identified in antiphospholipid antibody syndrome.

Hemophilia A (Choice B) refers to an inherited condition of factor VIII deficiency that presents with recurrent hemarthrosis and cutaneous bleeding early in childhood. A very prolonged PTT and very low or absent factor VIII concentrations would be expected.

Inhibitor to factor VIII (Choice C) often presents with spontaneous and refractory bleeding. Laboratory studies would demonstrate a markedly increased PTT with failure to correct after mixing studies.

Educational Objective: Von Willebrand disease is a common inherited cause of mucocutaneous bleeding and results from a deficiency in vWF concentrations or function. It is reflected by increased bleeding time, decreased factor VIII activity or concentration, and suppressed ristocetin cofactor activity. Treatment depends on the site and severity of bleeding and may include desmopressin or vWF concentrates.

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49. A 23-year-old woman comes to the physician for a follow-up examination. Six months ago, she underwent splenectomy because of injuries sustained in a motor vehicle collision. Her postoperative course has been uncomplicated. She has a headache once monthly and takes acetaminophen as needed. Immunizations are up-to-date. Vital signs are within normal limits. Examination shows no abnormalities except for a well-healed scar. She asks if any precautions are required before her dental appointment in 1 week. Which of the following is the most appropriate recommendation?

A) Postponement of dental work for 6 months
B) Measurement of serum complement concentrations
C) Influenza virus vaccine
D) Penicillin therapy prior to teeth cleaning
E) No precautions are necessary

Correct Answer: E.

The spleen's major function involves immune response through humoral and cell-mediated pathways. Splenectomy increases the risk for infection with encapsulated organisms such as *Haemophilus influenzae, Neisseria meningitidis*, and *Streptococcus pneumoniae*. Patients who are asplenic are at increased risk for infection and require up-to-date vaccination and, at times, antibiotic prophylaxis. Antibiotic prophylaxis is considered in patients with concurrent features that put them at high risk for severe infections, such as young age, other immunocompromised states, or history of sepsis with encapsulated organisms. Preprocedure antibiotic prophylaxis is sometimes recommended for patients undergoing procedures involving the respiratory tract or paranasal sinuses because of colonization by encapsulated organisms. Other procedures, such as dentistry procedures, do not require antibiotic prophylaxis in cases of splenectomy but may in cases of heart transplantation, when there's a history of endocarditis, and when artificial valves are present.

Incorrect Answers: A, B, C, and D.

Postponement of dental work for 6 months (Choice A) and penicillin therapy prior to teeth cleaning (Choice D) would not be necessary since dental procedures do not increase the risk for infection with encapsulated organisms.

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C) Influenza virus vaccine

D) Penicillin therapy prior to teeth cleaning

E) No precautions are necessary

Correct Answer: E.

The spleen's major function involves immune response through humoral and cell-mediated pathways. Splenectomy increases the risk for infection with encapsulated organisms such as *Haemophilus influenzae, Neisseria meningitidis*, and *Streptococcus pneumoniae*. Patients who are asplenic are at increased risk for infection and require up-to-date vaccination and, at times, antibiotic prophylaxis. Antibiotic prophylaxis is considered in patients with concurrent features that put them at high risk for severe infections, such as young age, other immunocompromised states, or history of sepsis with encapsulated organisms. Preprocedure antibiotic prophylaxis is sometimes recommended for patients undergoing procedures involving the respiratory tract or paranasal sinuses because of colonization by encapsulated organisms. Other procedures, such as dentistry procedures, do not require antibiotic prophylaxis in cases of splenectomy but may in cases of heart transplantation, when there's a history of endocarditis, and when artificial valves are present.

Incorrect Answers: A, B, C, and D.

Postponement of dental work for 6 months (Choice A) and penicillin therapy prior to teeth cleaning (Choice D) would not be necessary since dental procedures do not increase the risk for infection with encapsulated organisms.

Measurement of serum complement concentrations (Choice B) is done in the diagnosis of complement deficiency and certain immune and inflammatory diseases (eg, systemic lupus erythematosus). Complement deficiency, particularly of the terminal complement cascade, typically presents with recurrent infections with *Neisseria* species.

It is important for asplenic patients to be vaccinated against encapsulated organisms such as with the pneumococcal vaccine. Influenza virus vaccine (Choice C) is widely recommended, but this patient does not require an influenza vaccine prior to a dental procedure.

Educational Objective: Asplenia increases the risk for infection with encapsulated organisms such as *Haemophilus influenzae, Neisseria meningitidis*, and *Streptococcus pneumoniae*. Dentistry procedures do not require antibiotic prophylaxis in these patients.

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50. A 67-year-old man comes to the physician because of a 2-month history of progressive shortness of breath on exertion, muscle pain, fatigue, generalized weakness, and constipation. He also has had a decreased appetite, resulting in a 7-kg (15-lb) weight loss during this period. His current medications are hydrochlorothiazide for hypertension and laxatives. He smoked one pack of cigarettes daily for 40 years but quit 5 years ago. His temperature is 37.5°C (99.5°F), pulse is 85/min, respirations are 22/min, and blood pressure is 164/92 mm Hg. There is no jugular venous distention. Breath sounds are decreased, and scattered rhonchi are heard over the right upper lung field. Cardiac examination shows no abnormalities. Laboratory studies show:

Hemoglobin	14.2 g/dL
Leukocyte count	11,500/mm^3 with a normal differential
Serum	
Na^+	140 mEq/L
K^+	3.5 mEq/L
Cl^-	100 mEq/L
HCO_3^-	25 mEq/L
Ca^{2+}	13.3 mg/dL
Urea nitrogen	22 mg/dL
Glucose	72 mg/dL
Creatinine	0.8 mg/dL
Alkaline phosphatase	100 U/L

A chest x-ray shows a mass in the upper lobe of the right lung that extends into the hilum. Which of the following is the most likely cause of these laboratory findings?

A) Adverse effect of hydrochlorothiazide
B) Bone metastases from lung cancer
C) Paraneoplastic syndrome
D) Parathyroid carcinoma

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Alkaline phosphatase	100 U/L

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A) Adverse effect of hydrochlorothiazide
B) Bone metastases from lung cancer
C) Paraneoplastic syndrome
D) Parathyroid carcinoma
E) Primary hyperparathyroidism

Correct Answer: C.

Squamous cell carcinoma (SCC) of the lung is a subtype of non-small cell lung carcinoma (NSCLC). It is highly associated with a history of smoking, and is often found in the central lung, most commonly in the perihilar region and upper lung fields. Lung cancer typically presents with fatigue, progressive shortness of breath, and weight loss, with or without hemoptysis. SCC is associated with a paraneoplastic syndrome which results in hypercalcemia. SCC can produce parathyroid hormone related peptide (PTHrP). This exerts physiologic effects similar to parathyroid hormone (PTH). The abnormal, excessive secretion of PTHrP activates osteoclasts, gut calcium absorption, and kidney reabsorption of calcium, which consequently results in severe hypercalcemia. Phosphate concentrations are often decreased because of increased renal excretion. Hypercalcemia commonly presents with fatigue, generalized weakness, constipation, secondary hypertension, urinary tract calculi, and potential psychiatric disturbances. Treatment requires management of the underlying malignant cause of the paraneoplastic syndrome. The patient's hypercalcemia should also be managed with fluid resuscitation (if necessary), along with various methods for reducing the serum calcium concentration, including bisphosphonates, calcitonin, or furosemide with close attention to volume status.

Incorrect Answers: A, B, D, and E.

Adverse effect of hydrochlorothiazide (Choice A) is not likely the cause of this patient's hypercalcemia. Hydrochlorothiazide can result in the increased tubular reabsorption of calcium. This can be utilized in patients who are chronically hypocalcemic, but is unlikely to result in severe hypercalcemia, as it only mildly increases serum calcium

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Squamous cell carcinoma (SCC) of the lung is a subtype of non-small cell lung carcinoma (NSCLC). It is highly associated with a history of smoking, and is often found in the central lung, most commonly in the perihilar region and upper lung fields. Lung cancer typically presents with fatigue, progressive shortness of breath, and weight loss, with or without hemoptysis. SCC is associated with a paraneoplastic syndrome which results in hypercalcemia. SCC can produce parathyroid hormone related peptide (PTHrP). This exerts physiologic effects similar to parathyroid hormone (PTH). The abnormal, excessive secretion of PTHrP activates osteoclasts, gut calcium absorption, and kidney reabsorption of calcium, which consequently results in severe hypercalcemia. Phosphate concentrations are often decreased because of increased renal excretion. Hypercalcemia commonly presents with fatigue, generalized weakness, constipation, secondary hypertension, urinary tract calculi, and potential psychiatric disturbances. Treatment requires management of the underlying malignant cause of the paraneoplastic syndrome. The patient's hypercalcemia should also be managed with fluid resuscitation (if necessary), along with various methods for reducing the serum calcium concentration, including bisphosphonates, calcitonin, or furosemide with close attention to volume status.

Incorrect Answers: A, B, D, and E.

Adverse effect of hydrochlorothiazide (Choice A) is not likely the cause of this patient's hypercalcemia. Hydrochlorothiazide can result in the increased tubular reabsorption of calcium. This can be utilized in patients who are chronically hypocalcemic, but is unlikely to result in severe hypercalcemia, as it only mildly increases serum calcium concentrations.

Bone metastases from lung cancer (Choice B) are another potential cause of severe hypercalcemia in a patient with malignancy. This results in the direct lytic destruction of bone, which releases calcium into the serum. Patient's often present with severe bone pain at the site of osseous metastases, but would also manifest an increased serum alkaline phosphatase concentration on laboratory evaluation. This patient's alkaline phosphatase concentration is within reference ranges.

Parathyroid carcinoma (Choice D) is a potential cause, although rare, of primary hyperparathyroidism (Choice E). The most common cause of primary hyperparathyroidism is a functional parathyroid adenoma, followed by parathyroid hyperplasia. The excessive secretion of PTH would result in increased calcium and decreased phosphate serum concentrations, similar to the pattern seen in the setting of paraneoplastic PTHrP secretion. This patient presents with pulmonary findings on physical examination along with a significant history of smoking, which make lung cancer and an associated paraneoplastic syndrome more likely.

Educational Objective: Squamous cell carcinoma of the lung can result in the paraneoplastic production of PTHrP. This results in increased osteoclast activity, gut calcium absorption, and kidney reabsorption of calcium, similar to the physiologic effects of PTH. Hypercalcemia secondary to osseous metastases would also result in severe hypercalcemia but would likely be accompanied by focal bone pain at the site of metastases and an increased serum alkaline phosphatase concentration.

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1. An 87-year-old man comes to the physician because of problems with his memory over the past 6 months. During this period, he has occasionally misplaced his house keys and forgotten to buy certain grocery items unless he has a list. He still enjoys following the stock market daily and visiting his grandchildren monthly. He has a history of benign prostatic hyperplasia and cataracts. His wife has breast cancer, and he is worried that she will suffer. His temperature is 37°C (98.6°F), pulse is 70/min, and blood pressure is 155/90 mm Hg. Physical examination shows an enlarged prostate; no masses are palpated. Neurologic examination shows no focal findings; his speech is fluent, and there is no aphasia. On mental status examination, he is alert and oriented to person, place, and time. His eye contact is good. Range of affect is full. He recalls two of three objects after 5 minutes. Long-term memory is intact. Which of the following is the most likely explanation for these findings?

A) Capgras syndrome
B) Dementia, Alzheimer type
C) Lewy body dementia
D) Major depressive disorder
E) Metastatic prostate cancer
F) Multi-infarct (vascular) dementia
G) Normal aging

Correct Answer: G.

Normal aging includes a slow decline of executive functioning, processing speed, attention span, and problem-solving, particularly after age 70 years. As well, aging people tend to struggle with simple forgetfulness (eg, occasionally misplacing keys) and some difficulty with episodic and working memory. A normally aging individual should be able to still function in society (eg, socialize, perform daily routines). Engaging in novel cognitive tasks (eg, learning a new language) may delay or slow these cognitive changes. Many aging patients worry that these findings reflect developing dementia. If there is clinical suspicion, neurocognitive screening should be performed; otherwise, reassurance is appropriate.

Incorrect Answers: A, B, C, D, E, and F.

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otherwise, reassurance is appropriate.

Incorrect Answers: A, B, C, D, E, and F.

Capgras syndrome (Choice A) refers to a patient's delusional belief that their loved ones are impostors. Though this patient is worried about his wife, he does not believe she is an impostor.

Dementia, Alzheimer type (Choice B) is the most prevalent dementia, presenting with progressive cognitive decline that begins with short-term memory impairment, progresses to apraxia and language abnormalities, and culminates in behavioral and personality changes preventing the patient from performing basic activities of daily living. This patient demonstrates cognitive changes consistent with normal aging.

Lewy body dementia (Choice C) is a common dementia that is associated with cognitive fluctuations, visual hallucinations, REM sleep behavior disorder, and parkinsonism (eg, bradykinesia, resting tremor, muscle rigidity, postural instability). This patient demonstrates cognitive changes consistent with normal aging and does not demonstrate parkinsonism.

Major depressive disorder (Choice D) includes 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance. This patient demonstrates understandable worry about his wife's health condition.

Metastatic prostate cancer (Choice E) is unlikely. An enlarged prostate without palpable masses is consistent with this patient's history of benign prostatic hyperplasia, not malignancy. His cognitive changes are consistent with normal aging.

Multi-infarct (vascular) dementia (Choice F) refers to cognitive impairment that results from a history of stroke or silent cerebrovascular disease. Patients typically present with stepwise cognitive decline and focal neurologic deficits. This patient demonstrates cognitive changes consistent with normal aging and does not demonstrate focal neurologic deficits.

Educational Objective: Normal aging includes a slow decline of executive functioning, processing speed, episodic and working memory, attention span, and problem-solving. No intervention is needed other than the encouragement of cognitive stimulation.

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2. A 2-month-old boy is admitted to the hospital because of a 1-day history of coughing, rapid breathing, and poor feeding. He had a temperature of 39°C (102.2°F) 4 hours ago. He has not had a runny nose. One month ago, he was admitted to the hospital for 10 days for treatment of orbital cellulitis. He was born at term after an uncomplicated pregnancy and spontaneous vaginal delivery. Results of maternal prenatal screening, including HIV serologic studies, were negative. On admission, the patient is alert and has grunting respirations and mild intercostal retractions. His temperature is 37.9°C (100.2°F), pulse is 170/min, respirations are 86/min, and blood pressure is 74/48 mm Hg. Pulse oximetry on 40% oxygen via nasal cannula shows an oxygen saturation of 92%. Physical examination shows a supple neck with no adenopathy. Breath sounds are decreased bilaterally. Diffuse crackles are heard in both lungs. Cardiac examination shows a regular rhythm. S_1 and S_2 are normal. A grade 1/6, systolic ejection murmur is heard at the upper left sternal border. The abdomen is soft and nontender. The liver edge is firm and palpated 4 cm below the right costal margin, and the spleen tip is palpated 2 cm below the left costal margin. Laboratory studies show:

Hemoglobin	9.6 g/dL
Hematocrit	29%
Leukocyte count	9000/mm^3
Segmented neutrophils	70%
Bands	4%
Eosinophils	3%
Lymphocytes	20%
Monocytes	3%
Platelet count	220,000/mm^3
CD4+ T-lymphocyte count	150/mm^3 (Normal≥1750)
Serum	
IgA	<10 mg/dL
IgG	10 mg/dL
IgM	10 mg/dL

A chest x-ray shows diffusely hazy lung fields, no cardiomegaly, and a normal mediastinal silhouette. Which of the following is the most likely underlying diagnosis?

A) Chédiak-Higashi syndrome

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IgM	10 mg/dL

A chest x-ray shows diffusely hazy lung fields, no cardiomegaly, and a normal mediastinal silhouette. Which of the following is the most likely underlying diagnosis?

A) Chédiak-Higashi syndrome
B) Chronic granulomatous disease
C) HIV infection
D) Severe combined immunodeficiency (SCID)
E) Thymic-parathyroid dysplasia
F) X-linked agammaglobulinemia

Correct Answer: D.

Severe combined immunodeficiency (SCID) is the most likely underlying diagnosis in this patient with recurrent infections, a low CD4+ T-lymphocyte count, and low concentrations of immunoglobulins. SCID can occur as a result of several different mutations, although adenosine deaminase (ADA) deficiency is a common cause of SCID, resulting in deficiencies in both T and B lymphocyte lineages. Since plasma cells are differentiated B lymphocytes, impaired B lymphocyte development leads to low or absent immunoglobulin concentrations of every class. Patients with SCID are prone to recurrent viral, bacterial, and fungal infections starting at birth, failure to thrive, and severe lymphopenia with impaired cellular and humoral immunity. ADA deficiency results in the accumulation of a purine derivative called deoxyadenosine within the purine salvage pathway, which is converted to 5′-deoxyadenosine triphosphate and inhibits the action of ribonucleotide reductase, thereby preventing DNA synthesis in T and B lymphocytes. Additionally, deoxyadenosine is toxic to lymphocytes. The only potentially curative therapy is stem cell transplantation.

Incorrect Answers: A, B, C, E, and F.

Chédiak-Higashi syndrome (Choice A) is a rare, autosomal recessive disorder of the immune system caused by mutations in the lysosomal trafficking regulator gene (*LYST*) that encodes a protein essential for normal formation and transportation of lysosomes within the cell. The clinical manifestations include frequent bacterial infections, oculocutaneous albinism, peripheral neuropathy, and progressive neurologic dysfunction.

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Chronic granulomatous disease (CGD) (Choice B) results from a defect in the nicotinamide adenine dinucleotide phosphate (NADPH) oxidase complex. Common infecting bacteria include *Staphylococcus* spp, *B. cepacia*, and *Nocardia* spp. Patients with CGD are at risk for fungal infections, especially *Aspergillus* spp.

HIV infection (Choice C) is commonly acquired as a result of vertical transmission from an infected mother. This patient's mother does not have HIV.

Thymic-parathyroid dysplasia (Choice E), also known as DiGeorge syndrome, is caused by a deletion at chromosome 22q11 that leads to congenital absence of the thymus and the parathyroid glands. It results in T lymphocyte deficiency and hypocalcemia.

X-linked agammaglobulinemia (Choice F) occurs as a result of mutations in the *BTK* gene that encodes a tyrosine kinase essential for all stages of B lymphocyte development and proliferation. Patients lack functioning B lymphocytes and therefore have recurrent infections because of impaired humoral immunity.

Educational Objective: SCID can occur as a result of numerous mutations, although adenosine deaminase deficiency is a common cause. Patients present with recurrent bacterial, viral, and fungal infections starting early in life. Both cellular and humoral immunity are impaired as a result of deficiencies in T and B lymphocyte populations. Treatment is supportive, and only stem cell transplantation is potentially curable.

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3. A 55-year-old woman comes to the physician because of a 6-week history of easy bruising. Ten years ago, she underwent local resection and chemotherapy for cancer of the right breast. She takes no medications. Examination shows multiple cutaneous ecchymoses over the body, primarily over all the extremities. The spleen is not palpable. Her hemoglobin concentration is 12 g/dL, hematocrit is 34%, and platelet count is 34,000/mm^3. Which of the following is the most likely diagnosis?

A) Acute myelogenous leukemia
B) Aplastic anemia
C) Immune thrombocytopenic purpura
D) Metastatic breast cancer
E) Secondary hypersplenism

Correct Answer: C.

Immune thrombocytopenic purpura (ITP) is the most likely diagnosis in this patient with thrombocytopenia and cutaneous bruising in the absence of other abnormalities. Thrombocytopenia occurs as a result of platelet destruction caused by the presence of anti-GpIIb/IIIa antibodies that bind to platelets and result in their opsonization. Macrophages within the spleen then phagocytose the platelet-antibody complex, resulting in thrombocytopenia. ITP is diagnosed in the setting of a low platelet count in the absence of other explanatory causes for thrombocytopenia. Bone marrow biopsy will classically show an increased number of megakaryocytes indicating adequate platelet production but increased peripheral destruction of platelets. It classically presents with petechiae and purpura and prolonged bleeding time on laboratory analysis, although bleeding time is rarely measured in routine clinical practice. Severe ITP may lead to uncontrolled hemorrhage. Acute ITP often follows an infection and is generally self-limited. Chronic ITP is first treated with steroids, which may be required long-term, intravenous immunoglobulin, or immunomodulators. Refractory ITP that is nonresponsive to such therapies is treated with splenectomy, which results in remission of thrombocytopenia in the majority of cases as a result of the spleen's primary role in the underlying pathophysiology.

Incorrect Answers: A, B, D, and E.

Acute myelogenous leukemia (Choice A) is a malignancy of cells of the myeloid lineage and would present with peripheral myeloblasts apparent on the smear. While thrombocytopenia may occur, anemia is also common, as are systemic symptoms such as malaise, fevers, and weight loss.

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Incorrect Answers: A, B, D, and E.

Acute myelogenous leukemia (Choice A) is a malignancy of cells of the myeloid lineage and would present with peripheral myeloblasts apparent on the smear. While thrombocytopenia may occur, anemia is also common, as are systemic symptoms such as malaise, fevers, and weight loss.

Aplastic anemia (Choice B) results from bone marrow destruction of erythrocyte precursors and can be a primary autoimmune process, secondary to viral infections, medications, myelotoxin exposures (eg, heavy metals), or acquired clonal abnormalities. It manifests with anemia and inappropriately low reticulocyte count, not thrombocytopenia.

Metastatic breast cancer (Choice D) can lead to thrombocytopenia if malignant cells invade and displace normal bone marrow, but additional cytopenias such as anemia would also be expected, as would systemic symptoms of malignancy such as malaise and weight loss.

Secondary hypersplenism (Choice E) is unlikely since this patient has a normal spleen on physical examination. Additionally, secondary hypersplenism is caused by an underlying disease process such as cirrhosis, which this patient does not appear to have.

Educational Objective: ITP is a diagnosis of exclusion and presents with mucocutaneous bleeding and severe thrombocytopenia. It is a result of the antibody-mediated destruction of circulating platelets, and bone marrow biopsy will demonstrate increased numbers of megakaryocytes. Other cell lines including erythrocytes, lymphocytes, and granulocytes are unaffected.

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4. A previously healthy 27-year-old woman comes to the emergency department because of a 2-day history of fever, sore throat, and chills. Eight days ago, she received the diagnosis of *Escherichia coli* urinary tract infection and began a course of trimethoprim-sulfamethoxazole. During the past 6 years, she has had a total of four urinary tract infections. Her last menstrual period was 14 days ago. She is sexually active with one male partner and uses an oral contraceptive. She exercises regularly. Her temperature is 38.7°C (101.6°F), pulse is 96/min, respirations are 16/min, and blood pressure is 122/78 mm Hg. The sinuses are nontender. There is slight erythema of the oropharynx but no exudates. The remainder of the examination shows no abnormalities. Laboratory studies show:

Leukocyte count	2200/mm^3
Segmented neutrophils	4%
Lymphocytes	96%
Serum	
Na^+	140 mEq/L
K^+	4.6 mEq/L
Cl^-	105 mEq/L
HCO_3^-	24 mEq/L
Urea nitrogen	18 mg/dL
Creatinine	0.9 mg/dL
AST	34 U/L
ALT	37 U/L
β-hCG	negative
Urine	
RBC	0/hpf
WBC	3–4/hpf

An x-ray of the chest shows no abnormalities. Results of blood and urine cultures are pending. Which of the following is the most likely cause of this patient's neutropenia?

A) Cytomegalovirus infection

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An x-ray of the chest shows no abnormalities. Results of blood and urine cultures are pending. Which of the following is the most likely cause of this patient's neutropenia?

A) Cytomegalovirus infection
B) Drug-induced agranulocytosis
C) Epstein-Barr virus infection
D) Parvovirus infection
E) Sepsis

Correct Answer: B.

Drug-induced agranulocytosis from trimethoprim-sulfamethoxazole (TMP-SMX) is the most likely cause of this patient's pharyngitis and neutropenia. Neutropenia is defined by an absolute neutrophil count, which includes band forms, of less than 1,500 cells/mm^3. Agranulocytosis indicates neutrophil counts of less than 100 cells/mm^3, and this patient's neutrophil count of 88 cells/mm^3 is consistent with this diagnosis. The risk for spontaneous infection substantially increases when the neutrophil count drops below 500 cells/mm^3. Agranulocytosis is usually secondary to exposure to known myelotoxic agents such as chemotherapeutic drugs, but there are also a number of medications, including TMP-SMX, that may cause agranulocytosis through the binding of metabolites to neutrophil membranes or by inducing the formation of antineutrophil antibodies. Other commonly implicated medications include antithyroid drugs such as methimazole, antipsychotics such as clozapine, and some antiarrhythmic medications. Patients may present with severe infections as a result of neutropenia. Treatment involves immediate withdrawal of the implicated medication and treatment of any underlying infection. Additionally, granulocyte colony-stimulating factor (G-CSF) can sometimes hasten recovery.

Incorrect Answers: A, C, D, and E.

Cytomegalovirus (CMV) infection (Choice A) can cause primary infection in immunocompetent hosts with symptoms that are indistinguishable from those of Epstein-Barr virus (EBV) infection (mononucleosis) (Choice C). Patients present with fevers, myalgias, and laboratory evidence of atypical lymphocytosis, often with abnormal liver enzymes. Neither CMV nor EBV infection present with neutropenia; they more commonly present with atypical lymphocytosis.

Parvovirus infection (Choice D) is the cause of erythema infectiosum. This presents with pink patches on the bilateral cheeks of children giving an appearance of slapped

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Correct Answer: B.

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Parvovirus infection (Choice D) is the cause of erythema infectiosum. This presents with pink patches on the bilateral cheeks of children giving an appearance of slapped cheeks. This facial rash may be followed by a lacy, macular eruption on the trunk and extremities. In adults, it can sometimes cause arthralgias of the distal joints of the hands and has been associated with aplastic anemia in patients with underlying hematologic disease (eg, sickle cell disease).

Sepsis (Choice E) is incorrect. While this patient does have symptoms such as sore throat and fever that may indicate an underlying infection, her symptoms are more consistent with agranulocytosis. Additionally, she does not exhibit the other hallmark signs of sepsis, including hypotension, tachypnea, altered mental status, and other evidence of end-organ dysfunction in the setting of a known or suspected infection.

Educational Objective: Agranulocytosis is a rare complication of treatment with some types of medications including antipsychotics, antithyroid drugs, and antibiotics such as TMP-SMX, among others. Patients often present with sore throat, fever, and severe neutropenia with a total neutrophil count of less than 100 cells/mm^3. Treatment includes stopping the offending drug, treating any underlying infection, and sometimes the use of G-CSF.

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5. A 47-year-old woman comes to the physician because of difficulty sleeping for 2 months. During this period, she has been awakening at 3 AM and remaining awake worrying about work, even though she is tired. She has unstable angina pectoris and required placement of one coronary artery stent 6 months ago and a second stent 4 months ago. Her chest pain started to recur 1 month ago, and she now has it almost daily. Evaluation shows no organic cause for her recurring chest pain. She works as an attorney for a large firm and reports that she has been given more responsibility during the past year. For the past month, she has not enjoyed her work as much as she previously did. She forces herself to go to work and has difficulty paying attention while she is there. She is a gourmet cook but no longer prepares meals because she does not enjoy the taste of the food. Physical examination shows no abnormalities. On mental status examination, she has a sad and worried mood and a reactive affect. She is alert and oriented to person, place, and time. She states that she frequently becomes despondent, especially when she thinks about her heart disease. Which of the following is the most likely diagnosis?

A) Adjustment disorder
B) Dysthymic disorder
C) Generalized anxiety disorder
D) Major depressive disorder
E) Primary insomnia

Correct Answer: D.

This patient with depressed mood, anhedonia (decreased enjoyment of food or work), insomnia, concentration impairment, and hopelessness likely has a diagnosis of major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance. Hopelessness is also a strong indicator of an underlying MDD diagnosis. These symptoms disrupt everyday functioning. Depression and somatic symptoms (especially pain symptoms) commonly co-occur, which is postulated to arise from a common descending pain pathway. The most effective treatment involves both psychotherapy and antidepressant medication. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation. If present, inpatient psychiatric hospitalization should be considered.

Incorrect Answers: A, B, C, and E.

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Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Adjustment disorder (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated depression, anxiety, or conduct disturbances. This patient appears to meet MDD criteria and is experiencing several stressors (rather than a single stressor that explains all of her current symptoms).

Dysthymic disorder (Choice B), more commonly known as persistent depressive disorder, refers to at least three depression symptoms (including depressed mood during more days than not) that have endured for at least 2 years. This patient's depressive symptoms have lasted months, not years. As well, patients with persistent depressive disorder by definition do not experience a sufficient number of depressive symptoms to satisfy MDD criteria.

Generalized anxiety disorder (Choice C) presents with excessive and difficult to control worrying, hyperactivity, disordered sleep, fatigue, and trouble relaxing for at least 6 months. Though this patient worries and demonstrates disordered sleep, her depressive symptoms are predominant. Therefore, her disordered sleep is likely secondary to MDD.

Primary insomnia (Choice E), or psychophysiological insomnia, refers to difficulty sleeping that is related to psychological barriers to sleep rather than secondary to medical problems or other psychiatric diagnoses. This patient's insomnia is likely secondary to MDD.

Educational Objective: Symptoms of major depressive disorder include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, decreased energy, sleep disturbance, and/or appetite disturbance.

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6. A 43-year-old woman is brought to the emergency department 30 minutes after the onset of tonic-clonic movements of all extremities at home. Her son says she has a 10-year history of chronic back pain, for which she takes oxycodone and diazepam. She previously worked as a nurse but has not worked during the past 5 years because of the pain. She lives with her two adult sons. On arrival, the patient is observed speaking clearly while the tonic-clonic movements continue. The episode ends 20 minutes after arrival; following the episode, the patient is alert and fully oriented with intact memory. Vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 99%. Examination shows no evidence of incontinence or tongue biting during the episode. Which of the following is the most appropriate next step in management?

A) Addition of phenytoin to the medication regimen
B) EEG
C) Increasing the dosage of diazepam
D) Lumbar puncture for examination of cerebrospinal fluid
E) Reassurance that she did not have a neurologic event

Correct Answer: E.

Functional neurologic disorder involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. Epileptic seizures typically last less than 1 minute and are associated with an altered level of consciousness and disorientation during and after the seizure, which is inconsistent with this patient's presentation. As such, this patient is likely experiencing psychogenic nonepileptic events, a subtype of functional neurologic disorder in which patients experience involuntary seizure-like episodes that disrupt their daily life. Functional neurologic disorder is postulated to represent the subconscious conversion of intolerable emotional distress into physical symptoms. Psychiatric comorbidities such as depression are common but not present in all patients. Physicians should conduct a thorough history and physical examination and obtain laboratory and imaging studies to evaluate for medical or neurologic disease that may explain or partially explain the symptoms when the diagnosis is unclear. Treatment of functional neurologic disorder involves education about the diagnosis, physical therapy, and cognitive-behavioral therapy (CBT).

Incorrect Answers: A, B, C, and D.

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Incorrect Answers: A, B, C, and D.

Adding phenytoin (Choice A), an anticonvulsant, is unnecessary since this patient's episodes are nonepileptic.

EEG (Choice B) is sometimes used to exclude epileptic seizure when the diagnosis is unclear. However, this patient demonstrated several features inconsistent with epileptic seizures while observed by physicians in the emergency room, increasing the certainty of the diagnosis of a psychogenic nonepileptic event. As well, the event has ended, which significantly decreases the utility of EEG for excluding an epileptic seizure.

Increasing the dose of diazepam (Choice C) is likely to harm this patient psychologically and medically. It is unclear why this patient was originally prescribed diazepam for chronic pain, since CBT for chronic pain has more evidence than benzodiazepines (or opioids). Long-term benzodiazepine medication can create a psychological reliance that may interfere with CBT for functional neurologic disorder. As well, this patient is on a dangerous combination of opioids and benzodiazepines that could lead to respiratory depression with higher dosages.

Lumbar puncture (Choice D) is unnecessary. In patients with suspected epileptic seizures and infectious symptoms such as fever, nuchal rigidity, headache, and/or altered mental status, lumbar puncture may assist in evaluating for acute infection as the cause of the seizures. However, this patient's events appear nonepileptic and are not associated with infectious symptoms.

Educational Objective: Functional neurologic disorder involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. Psychogenic nonepileptic events are a subtype of functional disorder that can be diagnosed by recognizing clinical features inconsistent with epileptic seizures (eg, intact awareness during events, prolonged events). The treatment is psychotherapy.

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7. A 52-year-old woman is brought to the emergency department from a homeless shelter 1 hour after she awakened with confusion and agitation. On arrival, she is oriented to person but not to place or time. She is unable to provide any medical history. She had no medications with her at the shelter. She is tremulous and diaphoretic. Her temperature is 38.2°C (100.8°F), pulse is 124/min, and blood pressure is 170/106 mm Hg. Physical examination shows no other abnormalities. Urine toxicology screening is positive for Δ^9-tetrahydrocannabinol and tricyclic antidepressants. Which of the following is the most likely cause of this patient's current symptoms?

A) Alcohol intoxication
B) Alcohol withdrawal
C) Cannabis intoxication
D) Cannabis withdrawal
E) Tricyclic overdose

Correct Answer: B.

Alcohol increases the central nervous system activity of γ-aminobutyric acid (GABA), the main inhibitory neurotransmitter. Abrupt discontinuation of alcohol therefore leads to sympathetic (excitatory) excess. Uncomplicated alcohol withdrawal typically presents with tremors, anxiety, restlessness, headache, nausea, and diaphoresis, which can occur hours after the cessation of alcohol use. If left untreated, alcohol withdrawal can be complicated by seizures and alcoholic hallucinosis (auditory or visual hallucinations). Delirium tremens, the most concerning and life-threatening complication of alcohol withdrawal, involves severe confusion and disorientation, fluctuations in consciousness, agitation, visual hallucinations, and autonomic instability (fluctuations in heart rate and blood pressure with hyperthermia). Alcohol withdrawal is managed supportively with benzodiazepines (eg, lorazepam) to address agitation and prevent or treat the symptoms of withdrawal, along with fluids, nutritional supplementation, and frequent assessment including vital sign checks.

Incorrect Answers: A, C, D, and E.

Alcohol is a central nervous system depressant and intoxication (Choice A) can cause slurred speech, emotional lability, behavioral disinhibition, ataxia, and memory lapses (similar to benzodiazepine intoxication). In severe intoxication, stupor and respiratory depression can occur.

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Cannabis (Choice C) is a hallucinogen that causes euphoria, paranoia, hallucinations, cognitive slowing, conjunctival injection, and dilated pupils. Patients withdrawing from cannabis (Choice D) experience irritability, anxiety, depression, insomnia, restlessness, and decreased appetite.

Tricyclic overdose (Choice E) can cause confusion, delirium, cardiac arrhythmias, hypotension, and anticholinergic toxicity. In this patient with tremulousness, hypertension, tachycardia, and hyperthermia, autonomic instability secondary to alcohol withdrawal is more likely.

Educational Objective: Alcohol withdrawal typically presents with tremors, anxiety, restlessness, headache, nausea, and diaphoresis, and it can be complicated by seizures, alcoholic hallucinosis, and delirium tremens. It is treated with benzodiazepines.

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8. A 27-year-old woman comes to the physician because of a 1-year history of daily headaches involving her entire head. The headaches are worse in the afternoon, sometimes throbbing, and are associated with nausea and sensitivity to light. The headaches are worse during menses. She takes four to six tablets of acetaminophen with caffeine daily, which provides partial relief. She takes no other medications. She has smoked one-half pack of cigarettes daily for 10 years and drinks four beers weekly. She works the night shift at an industrial plant. Vital signs are within normal limits. Neurologic examination shows no focal findings. Which of the following is the most appropriate treatment for this patient's headaches?

A) Switching to daytime shift work
B) Cessation of alcohol consumption
C) Cessation of smoking
D) Discontinuation of acetaminophen with caffeine
E) Oral contraceptive therapy

Correct Answer: D.

Medication overuse headaches (MOHs) are headaches secondary to the overuse of acute symptomatic headache medications in patients with a pre-existing headache disorder. The diagnosis is made when patients experience headaches at least every other day and take pain medications at least every other day. The clinical features of MOHs may be similar to migraines (as in this patient) or tension-type headaches. Opioids, butalbital-containing medications, acetaminophen, nonsteroidal anti-inflammatory drugs, acetaminophen-aspirin-caffeine combined medications, triptans, and ergot medications are commonly associated with MOHs. Management includes education, discontinuation of the offending medication, and establishing a long-term headache regimen that includes appropriate preventive measures.

Incorrect Answers: A, B, C, and E.

Switching to daytime shift work (Choice A) may slightly improve this patient's headaches, since poor quality of sleep and sleep disturbances (common in night shift workers) have been associated with episodic migraine headaches. However, the daily regularity of this patient's headaches in conjunction with medication overuse is most consistent with MOH.

Cessation of alcohol consumption (Choice B) may slightly improve this patient's headaches, since alcohol is a migraine headache trigger. However, this patient

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D) Discontinuation of acetaminophen with caffeine

E) Oral contraceptive therapy

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Cessation of alcohol consumption (Choice B) may slightly improve this patient's headaches, since alcohol is a migraine headache trigger. However, this patient experiences headaches daily but does not drink daily, making alcohol an unlikely main cause of her headaches.

Cessation of smoking (Choice C) may slightly improve this patient's headaches, since smoking is a migraine trigger. However, the daily regularity of this patient's headaches in conjunction with medication overuse is most consistent with MOH.

Oral contraceptive therapy (Choice E) may exacerbate this patient's headaches. Oral contraceptive pills can cause hormone-induced headaches and estrogen-withdrawal headaches.

Educational Objective: Medication overuse headaches are headaches secondary to the overuse of acute symptomatic headache medications in patients with a pre-existing headache disorder. Management involves discontinuing the offending medication.

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9. A 25-year-old woman, gravida 1, para 1, delivers a 2268-g (5-lb) male newborn at 38 weeks' gestation. The mother received no prenatal care. She has no history of serious illness and takes no medications. During pregnancy, she drank four to six glasses of wine daily and used cocaine weekly. A photograph of the newborn is shown. Which of the following during the mother's pregnancy would have significantly decreased the risk of this fetal outcome?

A) Abstinence from alcohol
B) Abstinence from cocaine
C) Copper supplementation
D) Folic acid supplementation
E) Vitamin B_1 (thiamine) supplementation
F) Zinc supplementation

Correct Answer: D.

Anencephaly is a severe congenital defect in which the rostral neuropore fails to close during the first month of gestation, resulting in failure of the development of the forebrain. Anencephaly is often accompanied by a variety of other malformations, including defects of the skull, facial abnormalities, and ocular abnormalities. Anencephaly is not compatible with life and the treatment of neonates who survive birth is palliative, since the majority of neonates expire within days or weeks. Folate deficiency is the most common and important risk factor for anencephaly, as well as caudal neural tube defects (eg, spina bifida). The use of medications such as trimethoprim and antiepileptics also increases the risk for anencephaly. Daily supplementation of folate is recommended for all pregnant women and for those who are considering pregnancy.

Incorrect Answers: A, B, C, E, and F.

Abstinence from alcohol (Choice A) is helpful for the prevention of fetal alcohol syndrome, which presents with craniofacial dysmorphism (eg, smooth philtrum, narrow palpebral fissures), microcephaly, developmental delay, and learning disabilities.

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F) Zinc supplementation

Correct Answer: D.

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Incorrect Answers: A, B, C, E, and F.

Abstinence from alcohol (Choice A) is helpful for the prevention of fetal alcohol syndrome, which presents with craniofacial dysmorphism (eg, smooth philtrum, narrow palpebral fissures), microcephaly, developmental delay, and learning disabilities.

Abstinence from cocaine (Choice B) decreases the risk for fetal demise caused by placental abruption, as well as the risk for intrauterine growth restriction. Cocaine is not known to be directly associated with anencephaly.

Supplementation of copper (Choice C) or zinc (Choice F) is not known to directly affect the risk for anencephaly. Supplementation of copper or zinc are not typically recommended for pregnant women.

Vitamin B_1 (thiamine) supplementation (Choice E) is helpful for prevention of thiamine deficiency (beriberi), which may present in children with polyneuritis, muscle wasting, and heart failure. It does not prevent the development of anencephaly.

Educational Objective: Anencephaly is a severe congenital defect in which the rostral neuropore fails to close during the first month of gestation, resulting in failure of the development of the forebrain, as well as other skull and craniofacial abnormalities. Folate deficiency is the most common and important risk factor for anencephaly, as well as caudal neural tube defects.

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10. An 11-year-old boy is brought to the emergency department because of a 1-hour history of severe pain and blurred vision in his right eye that began when he was hit in the eye with a tennis ball. He says his eye was closed when he was hit. He has no history of serious illness and takes no medications. He cries and appears anxious but gradually calms down. Vital signs are within normal limits. Ophthalmologic examination of the right eye shows mild periorbital edema; pooling blood in the anterior chamber obscures the lower third of the iris and pupil. Blinking does not increase pain. Gaze is conjugate and symmetric. The right pupil is slightly larger and less reactive to light compared to the left pupil. There are no foreign bodies or visual field defects. The remainder of the neurologic examination shows no focal findings. Which of the following is the most likely diagnosis?

A) Concussion
B) Corneal abrasion
C) Hyphema
D) Orbital fracture
E) Retro-orbital bleeding
F) Subconjunctival hemorrhage

Correct Answer: C.

The accumulation of blood within the anterior chamber of the eye is known as a hyphema. Hyphema most commonly occurs as a result of blunt ocular trauma and damage to the vasculature of the iris, trabecular meshwork, or ciliary body, although it may also be spontaneous or occur secondary to intraocular surgery. A thorough ophthalmic examination, with special attention paid to the intraocular pressure and to examination of the angle, is essential, since hyphema can result in increased intraocular pressure caused by clogging of the trabecular meshwork with red blood cells and is often also accompanied by damage to the angle itself. These secondary forms of injury may result in ghost cell glaucoma or angle-recession glaucoma, respectively. A sufficiently large hyphema may also lead to corneal blood staining, in which the cornea becomes permanently discolored, a condition that often requires corneal transplantation. Topical treatment is aimed at decreasing intraocular inflammation, lowering intraocular pressure, and providing cycloplegia for comfort and prevention of scar formation. Patients with hyphema are at increased risk for rebleeding within the first 5 days following the initial bleed, with rebleeding events often being more severe than the initial bleed.

Incorrect Answers: A, B, D, E, and F.

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becomes permanently discolored, a condition that often requires corneal transplantation. Topical treatment is aimed at decreasing intraocular inflammation, lowering intraocular pressure, and providing cycloplegia for comfort and prevention of scar formation. Patients with hyphema are at increased risk for rebleeding within the first 5 days following the initial bleed, with rebleeding events often being more severe than the initial bleed.

Incorrect Answers: A, B, D, E, and F.

Concussion (Choice A) is a mild form of traumatic brain injury. It commonly presents with confusion and amnesia, headache, and dizziness. While concussions may be coincident with a variety of ocular injuries, they do not result *per se* in hyphema.

Corneal abrasion (Choice B) often results from ocular trauma and is characterized by an abrasion of the corneal epithelium. Positive fluorescein staining within the epithelial defect is characteristic. Patients often report blurry vision, tearing, foreign body sensation, and pain that is worse with blinking. Corneal abrasions are treated prophylactically with topical antibiotics and typically resolve within 1 to 2 days.

Orbital fracture (Choice D) may occur secondary to blunt trauma and is most commonly characterized by fractures of the orbital floor or medial wall into the maxillary or ethmoid sinuses, respectively. Herniation of orbital fat or extraocular muscles may result in diplopia, especially in children. Patients may also present with posterior displacement (enophthalmos) or downward displacement (hypoglobus) of the globe, which may require surgical repair to provide a cosmetically acceptable result and to decrease diplopia. Patients with orbital fracture should be cautioned against nose-blowing, which can produce orbital emphysema and optic nerve compression.

Retro-orbital bleeding (Choice E) may occur secondary to ocular trauma and results in proptosis and often significant periorbital edema and ecchymosis. There is often significant pain, decreased vision, and a relative afferent pupillary defect. Patients with retro-orbital bleeding and high intraocular pressure, or evidence of optic nerve dysfunction, should undergo immediate lateral canthotomy and cantholysis to alleviate retro-orbital pressure and optic nerve compression.

Subconjunctival hemorrhage (Choice F) results from the rupture of capillaries within the conjunctiva, leading to the accumulation of blood between the conjunctiva and the sclera. While it may occur in the setting of ocular trauma, it is usually a benign finding.

Educational Objective: The accumulation of blood within the anterior chamber of the eye is known as a hyphema. Hyphema commonly occurs as a result of blunt ocular trauma and damage to the vasculature of the iris, trabecular meshwork, or ciliary body. A thorough examination by an ophthalmologist is warranted, since hyphema may be associated with severe complications, including glaucoma, corneal blood staining, and rebleeding.

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11. A 15-year-old girl is brought to the physician 2 weeks after noticing multiple areas on her chest and upper back that are lighter than the rest of the skin. She has mild itching over these areas when she plays volleyball. A photograph of the lesions is shown. Which of the following is the most likely diagnosis?

A) Actinic keratosis
B) Atopic dermatitis

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11. A 15-year-old girl is brought to the physician 2 weeks after noticing multiple areas on her chest and upper back that are lighter than the rest of the skin. She has mild itching over these areas when she plays volleyball. A photograph of the lesions is shown. Which of the following is the most likely diagnosis?

A) Actinic keratosis
B) Atopic dermatitis
C) Contact dermatitis
D) Discoid lupus erythematosus
E) Impetigo
F) Rosacea
G) Seborrheic dermatitis
H) Tinea corporis
I) Tinea versicolor
J) Urticaria
K) Vitiligo

Correct Answer: I.

Tinea versicolor is a superficial infection of the epidermis caused by *Malassezia furfur*. Clinically, it is characterized by hypopigmented and hyperpigmented macules and patches with a fine scale. The infection has a predilection for sites with increased sebum production such as the chest and back. Patients commonly notice the rash after spending time outdoors, since *Malassezia furfur* inhibits tanning of the affected areas, making them more noticeable when compared with the unaffected neighboring skin. A potassium hydroxide preparation of a skin scraping can be helpful and will show fungal spores and short hyphae along the edges of epidermal cells. Tinea versicolor may be treated using topical antifungal preparations including topical ketoconazole or selenium sulfide preparations.

Incorrect Answers: A, B, C, D, E, F, G, H, J, and K.

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J) Urticaria

K) Vitiligo

Correct Answer: I.

Tinea versicolor is a superficial infection of the epidermis caused by *Malassezia furfur*. Clinically, it is characterized by hypopigmented and hyperpigmented macules and patches with a fine scale. The infection has a predilection for sites with increased sebum production such as the chest and back. Patients commonly notice the rash after spending time outdoors, since *Malassezia furfur* inhibits tanning of the affected areas, making them more noticeable when compared with the unaffected neighboring skin. A potassium hydroxide preparation of a skin scraping can be helpful and will show fungal spores and short hyphae along the edges of epidermal cells. Tinea versicolor may be treated using topical antifungal preparations including topical ketoconazole or selenium sulfide preparations.

Incorrect Answers: A, B, C, D, E, F, G, H, J, and K.

Actinic keratosis (Choice A) is a premalignant lesion that may progress to squamous cell carcinoma. Clinically, lesions typically appear as light pink, ill-defined macules with a gritty texture in areas of prolonged sun exposure, such as the face, ears, and dorsal hands.

Atopic dermatitis (Choice B) presents with a chronic and pruritic rash on flexor surfaces of the extremities. It is associated with asthma, allergic rhinitis, and food allergies.

Contact dermatitis (Choice C) is a type IV (delayed) hypersensitivity reaction caused by exposure of the skin to either an irritant or allergen, which results in an eczematous rash in the distribution of the exposure. Acute contact dermatitis is characterized by small weeping vesicles with surrounding erythema. Over time, the vesicles resolve and are replaced by scaly, lichenified patches.

Discoid lupus erythematosus (Choice D) presents with plaques with hyperpigmented edges and pink, atrophic centers in sun-exposed sites. It can present as an isolated finding or can be a manifestation of systemic lupus erythematosus.

Impetigo (Choice E) is a contagious, childhood bacterial skin infection of the face and extremities with lesions that progress from papules to vesicles and crusts that have a yellow, gold, or honey color.

Rosacea (Choice F) presents with scattered erythematous papules and pustules on the forehead, cheeks, and chin. Dilated telangiectasias on the nose and cheeks are often seen. It is triggered by sun, caffeine, and heat.

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Seborrheic dermatitis (Choice G) is also caused by an overgrowth of the yeast *Malassezia* but typically presents as erythematous, greasy patches with yellow scale along the sides of the nose, in the eyebrows, along the ears and beard area, and in the scalp (dandruff).

Tinea corporis (Choice H) is caused by a superficial dermatophyte infection of the skin, most often *Trichophyton tonsurans*. The classic appearance is a round, annular patch with a scaly border.

Urticaria (Choice J) are erythematous, slightly edematous plaques or wheals that develop in response to triggers such as a medication, food, or recent viral illness, or they are idiopathic.

Vitiligo (Choice K) is caused by the immune destruction of melanocytes. It presents as completely depigmented rather than hypopigmented patches, which have a predilection for developing around the mouth, nose, eyes, hands, and genitalia.

Educational Objective: Tinea versicolor is characterized by hypopigmented and hyperpigmented macules and patches with a fine scale. The infection has a predilection for sites with increased sebum production such as the chest and back. It is caused by a superficial infection with the yeast *Malassezia furfur*. Treatment is with topical antifungal preparations including topical ketoconazole or selenium sulfide preparations.

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12. A 42-year-old woman with rheumatoid arthritis is admitted to the hospital because of a 3-day history of fever, intermittent severe chest pain, mild abdominal pain, and malaise. She also has a 1-week history of increasing fatigue. The chest pain worsens with inspiration, and she says she now sleeps most comfortably while leaning over her kitchen table. During the past week, she has had increased joint pain and decreased appetite. She has not had vomiting or changes in bowel function. Her medications are methotrexate, prednisone, and acetaminophen with codeine. She does not smoke cigarettes, drink alcohol, or use illicit drugs. She is in moderate distress. She is 165 cm (5 ft 5 in) tall and weighs 59 kg (130 lb); BMI is 22 kg/m^2. Her temperature is 38.6°C (101.4°F), pulse is 90/min, respirations are 22/min and shallow, and blood pressure is 140/88 mm Hg. On examination, a pleural friction rub is heard over the lower lobe of the right lung, and a pericardial friction rub is heard over the anterior aspect of the left hemithorax. The spleen tip is palpated 2 cm below the left costal margin. There is no peripheral edema. There is thickening of the synovial membranes and tenderness to palpation of the hands and feet. Laboratory studies show:

Hemoglobin	11.1 g/dL
Hematocrit	33%
Mean corpuscular volume	88 µm^3
Leukocyte count	1800/mm^3
Segmented neutrophils	65%
Eosinophils	2%
Basophils	1%
Lymphocytes	30%
Monocytes	2%
Platelet count	155,000/mm^3
Serum	
Urea nitrogen	24 mg/dL
Creatinine	1.2 mg/dL
AST	12 U/L
ALT	24 U/L

Which of the following is the most likely diagnosis?

A) Amyloidosis

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Creatinine	1.2 mg/dL
AST	12 U/L
ALT	24 U/L

Which of the following is the most likely diagnosis?

A) Amyloidosis
B) Bacterial endocarditis
C) Cirrhosis
D) Felty syndrome
E) HIV infection
F) Leukemia
G) Tuberculosis

Correct Answer: D.

Felty syndrome is the most likely diagnosis in this patient with rheumatoid arthritis (RA) and new-onset fevers, pleurisy, neutropenia, and splenomegaly. It is a rare disease that is more likely to occur in patients with poorly controlled RA who have longstanding disease and positive rheumatoid factor or anti-citrullinated peptide antibodies. Neutropenia occurs through several mechanisms including the production of antibodies against granulocyte colony-stimulating factor or the production of lymphocytes that target neutrophil precursors in the bone marrow. In addition to erosive joint disease, neutropenia, and splenomegaly, patients with Felty syndrome may also present with underlying infections, particularly of the lower respiratory tract. Infection should be suspected in all patients with Felty syndrome and fever. Other occasional findings include evidence of vasculitis, pericarditis, pleuritis, anemia, and thrombocytopenia. Patients also have an increased risk for developing non-Hodgkin lymphoma. Rituximab, a monoclonal antibody against CD20, which is present on B lymphocytes, is the drug of choice for patients already on methotrexate. Biologic agents that target tumor necrosis factor αare not efficacious.

Incorrect Answers: A, B, C, E, F, and G.

Amyloidosis (Choice A) is an infiltrative disorder caused by the deposition of abnormal proteins in tissue. The kidneys are commonly involved, with abnormal protein

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tumor necrosis factor are not efficacious.

Incorrect Answers: A, B, C, E, F, and G.

Amyloidosis (Choice A) is an infiltrative disorder caused by the deposition of abnormal proteins in tissue. The kidneys are commonly involved, with abnormal protein deposits in the mesangium that display an apple-green birefringence with Congo red dye on histologic analysis, although other organs such as the gastrointestinal tract and the heart are often involved.

Bacterial endocarditis (Choice B) presents with recurrent fevers and septic embolic phenomena such as Janeway lesions and Osler nodes in patients with risk factors such as intravenous drug use, rheumatic heart disease, or prosthetic heart valves. Positive blood cultures for a typical organism are generally required for the diagnosis.

Cirrhosis (Choice C) may present with splenomegaly, but patients also frequently have other manifestations such as ascites, esophageal varices, thrombocytopenia, and evidence of estrogen excess. Neutropenia is atypical, as are fevers, so this diagnosis is unlikely.

HIV infection (Choice E) commonly presents with an acute febrile illness that resolves spontaneously. Eventually, as the virus infects and kills CD4+ T lymphocytes, patients may develop signs and symptoms of opportunistic infections. Laboratory analysis discloses lymphopenia, not neutropenia.

Leukemia (Choice F) is a consideration in patients with a suspected diagnosis of Felty syndrome as large granular lymphocyte (LGL) leukemia. LGL proliferation is often seen in patients with Felty syndrome, although these cells will be polyclonal. To rule out LGL leukemia, the peripheral blood should be sent for flow cytometry to evaluate clonality. In the absence of this, Felty syndrome is the more likely diagnosis.

Tuberculosis (Choice G) often presents with pulmonary symptoms, including chronic cough, and systemic symptoms such as cachexia in patients with risk factors for tuberculosis, such as those who live in endemic areas, reside in prison or in homeless shelters, or are intravenous drug users. Splenomegaly and arthritis are not characteristic of this diagnosis.

Educational Objective: Felty syndrome should be suspected in patients with longstanding, poorly controlled, seropositive RA with new-onset splenomegaly and neutropenia. A peripheral smear should be evaluated to exclude LGL leukemia. Rituximab, a monoclonal antibody targeting CD20 expressed on the surface of B lymphocytes, is the treatment of choice.

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13. A 54-year-old man comes to the office because of a 4-month history of progressive weakness and numbness of his left leg. He has a 5-year history of type 2 diabetes mellitus treated with metformin. He has worked as a plumber for 34 years; he often crawls into and works in tight spaces, and he frequently moves and lifts heavy objects. On neurologic examination, muscle strength is 5−/5 in the thigh adductor, quadriceps, and tibialis anterior muscles on the left and intact on the right. Muscle strength is intact in the iliopsoas, gluteus maximus, thigh abductor, hamstrings, and gastrocnemius muscles bilaterally. Deep tendon reflexes are 1+ in the left knee, 2+ in the right knee, and 2+ in the ankles. Sensation to light touch is mildly decreased over the medial-distal aspect of the left lower extremity and medial aspect of the left foot. Sensation otherwise is intact. Which of the following is the most likely diagnosis?

A) Common peroneal neuropathy
B) Femoral neuropathy
C) L4 radiculopathy
D) Obturator neuropathy
E) S1 radiculopathy

Correct Answer: C.

Radiculopathy refers to the neurologic symptoms secondary to the compression of spinal nerve roots, which commonly results from a narrow or stenotic neural foramen, a herniated intervertebral disc, spondylolisthesis (displacement of a vertebra), or compression from extrinsic sources such as tumors. Heavy lifting is a risk factor for degenerative disc disease and disc herniation because of acute increases in intradiscal pressure, which can lead to narrowing of the neural foramina or herniation of the disc. Radiculopathy is common in the lumbosacral region. Pain, sensory deficits, and motor dysfunction typically occur in the dermatomal and myotomal distribution that correlates to the affected nerve root. Within the lumbosacral plexus, there is often significant combined contribution of innervation across dermatomes and myotomes, such that deficits typically associated with one vertebral level may overlap with adjacent levels. L4 radiculopathy typically presents with weakness of knee extension and hip adduction and a diminished patellar reflex, along with pain and numbness of skin overlying the medial buttock, lateral thigh, medial leg, foot dorsum, and hallux, though deficits may appear to a lesser extent in territories also associated with L3 and L5 as anatomic variation exists. Management of radiculopathy includes treatment of the underlying problem, analgesia if needed, and consideration of surgical correction in refractory cases or in patients with progressive or severe/impairing neurologic symptoms. Many symptoms resolve with conservative management with anti-inflammatory and analgesic medications and physical therapy.

Incorrect Answers: A, B, D, and E

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Incorrect Answers: A, B, D, and E.

Common peroneal neuropathy (Choice A) typically presents with impairment in ankle dorsiflexion (foot drop), great toe extension, and foot eversion, along with sensory loss of the dorsum of the foot. Weakness of knee extension and hip adduction along with sensory deficits of the medial lower extremity would be atypical.

Femoral neuropathy (Choice B) typically leads to weakness of hip flexion (secondary to quadriceps involvement), knee extension, diminished patellar reflex, and impaired sensation of the anterior thigh. Impaired hip adduction and sensation of the distal lower extremity would be atypical.

Obturator neuropathy (Choice D) typically presents with impairment in hip adduction (secondary to adductor longus, magnus, and gracilis involvement) and sensation of the medial proximal thigh. Impaired knee extension and sensation of the distal lower extremity would be atypical.

S1 radiculopathy (Choice E) commonly leads to weakness of ankle plantarflexion along with pain and sensory loss of the skin overlying the buttock, thigh, and posterior leg. Impaired hip adduction, knee extension, and sensation of the foot and medial aspect of the lower extremity would be atypical.

Educational Objective: Radiculopathy refers to nerve root pathology that leads to weakness, numbness, paresthesias, and pain in the dermatomal and myotomal distribution that correlates to the affected root. L4 radiculopathy typically presents with weakness of knee extension and hip adduction, diminished patellar reflex, and pain and numbness of the medial buttock, lateral thigh, medial leg, foot dorsum, and hallux.

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14. A 5-year-old girl with spastic diplegic cerebral palsy and gastroesophageal reflux disease is brought to the office by her parents for a routine examination. She wears leg braces and occasionally uses a wheelchair for ambulation. Since her last visit 6 months ago, she has had intermittent shortness of breath when walking long distances and has tended to lean toward the right. Her parents say she has had decreased tolerance for sitting in her wheelchair. She was born at 31 weeks' gestation by cesarean delivery to a 21-year-old woman, gravida 4, para 4; pregnancy was complicated by chorioamnionitis. The patient has undergone soft-tissue release for contractures in her hips and lower extremities. Her medications are baclofen and lansoprazole. She is alert and fully oriented, and she answers questions appropriately. She is at the 40th percentile for height and weight. Vital signs are within normal limits. Mild impingement of the rib cage on the right iliac crest is noted. Cardiopulmonary examination shows no abnormalities. Pelvic obliquity is present. Examination of the upper extremities shows less spasticity and moderate fine motor control when compared with the lower extremities. There is mild tenderness to palpation of the right lower rib cage where it abuts the right iliac crest. Patellar and Achilles deep tendon reflexes are 3+ bilaterally. Which of the following is the most appropriate next step in diagnosis?

A) Bone scan
B) Electromyography and nerve conduction studies
C) Gait analysis
D) MRI of the brain
E) X-rays of the spine

Correct Answer: E.

X-rays of the spine are the most appropriate next step in the management of this patient developing symptoms and signs of scoliosis. Her symptoms of dyspnea on exertion, decreased tolerance for sitting in her wheelchair, the tendency to lean toward the right, and impingement of the rib cage on the iliac crest suggest this diagnosis. This diagnosis is confirmed with x-rays of the spine. Scoliosis is defined as lateral curvature of the spine that is greater than 10 degrees. Scoliosis may occur idiopathically or may be secondary to a neuromuscular condition like cerebral palsy, as in this case, or a congenital anomaly. Neuromuscular scoliosis is caused by an imbalance in the muscles of the trunk and postural abnormalities. Mild scoliosis may begin asymptomatically, but periods of increased growth during childhood or adolescence can cause significant progression over a relatively short period of time. The most concerning consequence of scoliosis is pulmonary or cardiovascular compromise. Scoliosis may be the cause of restrictive lung disease as a result of the inability to fully expand the rib cage when inspiring and is likely responsible for the patient's intermittent shortness of breath when walking long distances. A diagnosis of scoliosis is confirmed using x-rays, which allow the angles of the spine to be measured. Management includes

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D) MRI of the brain

E) X-rays of the spine

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Bone scan (Choice A) is a nuclear medicine study that is used to further characterize a concerning osseous lesion or identify osteoblastic metastatic disease (eg, prostate and breast cancer). It is not used to diagnosis scoliosis or monitor its progression.

Neuromuscular scoliosis occurs because of lateral curvature of the spine secondary to muscle imbalance or postural abnormalities caused by an underlying neuromuscular condition. However, since this patient's underlying neuromuscular condition of cerebral palsy has already been diagnosed, electromyography and nerve conduction studies (Choice B) are not necessary. Instead, x-rays are needed to quantify the degree of scoliosis present.

Gait analysis (Choice C) may be useful later in the treatment of this patient's scoliosis since gait abnormalities related to her cerebral palsy may worsen her scoliosis. However, the best initial test in this case is x-rays of the spine to first confirm the diagnosis.

MRI of the brain (Choice D) is not necessary at this time. The patient's neurologic symptoms (including mild spasticity and lower extremity hyperreflexia) can be attributed to her known diagnosis of cerebral palsy.

Educational Objective: Scoliosis is defined as lateral curvature of the spine that is greater than 10 degrees. It may be idiopathic or secondary to an underlying

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MRI of the brain (Choice D) is not necessary at this time. The patient's neurologic symptoms (including mild spasticity and lower extremity hyperreflexia) can be attributed to her known diagnosis of cerebral palsy.

Educational Objective: Scoliosis is defined as lateral curvature of the spine that is greater than 10 degrees. It may be idiopathic or secondary to an underlying neuromuscular disorder or congenital anomaly. A diagnosis of scoliosis is confirmed using x-rays, which allow the angles of the spine to be measured.

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15. A 37-year-old woman comes to the physician for endocarditis prophylaxis prior to undergoing tooth extraction. The patient reports mouth pain but otherwise feels well. Two years ago, echocardiography showed mitral valve prolapse and trace mitral regurgitation. She has no other history of serious illness and takes no medications. Vital signs are within normal limits. Cardiac examination shows a normal S_1 and S_2; there is no S_3 or S_4, and no murmurs are heard. Which of the following is the most appropriate oral antibiotic prophylaxis prior to this patient's dental procedure?

A) Amoxicillin
B) Azithromycin
C) Clindamycin
D) Moxifloxacin
E) No antibiotic prophylaxis is indicated

Correct Answer: E.

No antibiotic prophylaxis is indicated in this patient with mitral valve prolapse and no prior history of bacterial endocarditis who is about to undergo a dental procedure. Antibiotic prophylaxis with amoxicillin given as a single dose of 2 g thirty minutes prior to a dental procedure is only indicated for patients at the highest risk for severe complications from infective endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, patients with any type of prosthetic valve, and those with unrepaired congenital cyanotic heart disease. While rare, patients with valvular disease in a transplanted heart should also be given prophylaxis. For patients unable to take amoxicillin because of an allergy, other alternatives include vancomycin, azithromycin, clindamycin, or a cephalosporin.

Incorrect Answers: A, B, C, and D.

Amoxicillin (Choice A) is the prophylactic drug of choice for patients who meet criteria for prophylaxis, but this patient does not fall into any of those categories.

Azithromycin (Choice B) and clindamycin (Choice C) are both reasonable alternatives for patients who meet criteria for prophylaxis but are unable to tolerate amoxicillin.

Moxifloxacin (Choice D) is not routinely used for prophylaxis against bacterial endocarditis.

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Incorrect Answers: A, B, C, and D.

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Azithromycin (Choice B) and clindamycin (Choice C) are both reasonable alternatives for patients who meet criteria for prophylaxis but are unable to tolerate amoxicillin.

Moxifloxacin (Choice D) is not routinely used for prophylaxis against bacterial endocarditis.

Educational Objective: Patients with unrepaired congenital cyanotic heart disease, a prior history of endocarditis, or those with prosthetic valves should receive antibiotic prophylaxis against endocarditis prior to invasive dental or respiratory tract procedures. The treatment of choice is typically amoxicillin.

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16. An 18-year-old man has the sudden onset of rapid, pounding heartbeats. A previous episode occurred while he was drinking coffee and resolved abruptly after 30 minutes. His pulse is 180/min, respirations are 15/min, and blood pressure is 105/85 mm Hg. Examination shows no other abnormalities. Which of the following is the most likely diagnosis?

A) Atrial fibrillation
B) Multifocal atrial tachycardia
C) Paroxysmal supraventricular tachycardia
D) Paroxysmal ventricular tachycardia
E) Premature atrial beats
F) Premature ventricular beats
G) Sinus tachycardia
H) Third-degree atrioventricular block

Correct Answer: C.

Supraventricular tachycardia (SVT) refers to an abnormally rapid heart rate and rhythm originating from above the ventricles, typically with a narrow QRS complex on ECG. Patients with SVT can manifest with acute symptoms of light-headedness, palpitations, diaphoresis, and syncope. SVT is typically a result of structural defects in the His-Purkinje system causing a reentrant pathway, such as in Wolff-Parkinson-White syndrome, but may also occur in structurally normal hearts spontaneously or provoked by alcohol, caffeine, exertion, stress, or sympathomimetic medications. Paroxysmal supraventricular tachycardia refers to a subset of regular, narrow QRS tachyarrhythmias that are intermittent in nature, with abrupt onset and termination. Atrioventricular nodal reentrant tachycardia (AVNRT) is the most common form of paroxysmal SVT. Other types include AV reentrant tachycardia, intra-atrial reentrant tachycardia, and junctional ectopic tachycardia. Initial management consists of vagal maneuvers, adenosine, calcium channel blockers, or β-adrenergic blockers. Hemodynamically unstable patients require electrical cardioversion.

Incorrect Answers: A, B, D, E, F, G, and H.

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Incorrect Answers: A, B, D, E, F, G, and H.

Atrial fibrillation (Choice A) may present with episodic tachycardia, heart palpitations, shortness of breath, dizziness, and anxiety. It is more common in patients with underlying structural heart disease. Paroxysmal SVT is more likely in an otherwise healthy 18-year-old patient with symptom onset provoked by caffeine.

Multifocal atrial tachycardia (Choice B) is characterized by an irregularly irregular rhythm and polymorphic P waves. It is associated with chronic pulmonary disease.

Paroxysmal ventricular tachycardia (Choice D) is more commonly associated with underlying structural heart disease. Nonsustained ventricular tachycardia is often asymptomatic or may present with palpitations, chest pain, and dyspnea. Sustained ventricular tachycardia is potentially life-threatening because of loss of adequate cardiac output and risk for devolving into ventricular fibrillation. SVT is more likely in a young, otherwise healthy patient.

Premature atrial beats (Choice E) are fairly common and typically present in isolation, often asymptomatic or with the patient experiencing a “skipped beat” sensation. Premature atrial beats occur more often in the presence of structural heart disease.

Premature ventricular beats (Choice F) are common and increase in prevalence with age and medical comorbidities. They are typically benign and asymptomatic.

Sinus tachycardia (Choice G) typically has a more gradual, ramping onset and decrease. An abrupt change in heart rate is more consistent with a tachyarrhythmia.

Third-degree atrioventricular block (Choice H) can present with variable symptoms depending on the rate of the escape rhythm stimulating the ventricles. Symptoms include fatigue, dyspnea, chest pain, and presyncope. Patients may also present with syncopal episodes or sudden cardiac arrest. Bradycardia is common.

Educational Objective: AVNRT is the most common type of paroxysmal SVT that occurs in structurally normal hearts, and it is often provoked by alcohol, caffeine, exertion, stress, or sympathomimetic medications. It is characterized by a regular rhythm with abrupt onset and termination.

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17. A 66-year-old woman comes to the office because of a 6-month history of severe dizziness and a spinning sensation that occurs when she looks up or turns her head quickly. She says she fell 1 week ago during an episode. At that time, she had a brief episode of double vision. She also has a 2-year history of moderate neck pain, which she attributes to "muscle spasms"; since her fall, her pain has become more severe. She has hypertension and type 2 diabetes mellitus. Her medications are lisinopril and metformin. Her mother had a cerebral infarction at the age of 70 years. The patient has smoked one-half pack of cigarettes daily for 40 years. Her pulse is 84/min, and blood pressure is 150/85 mm Hg. Examination shows no nystagmus. Visual field testing shows no abnormalities. There are no cervical bruits. On palpation of the posterior muscles of the neck, there is mild tenderness that increases when the neck is rotated gently. Cardiopulmonary examination shows no abnormalities. Muscle strength is 5/5 in all extremities. Which of the following is the most likely explanation for this patient's symptoms?

A) Carotid artery dissection
B) Cervical intervertebral disc disease
C) Glomus vagale tumor
D) Ligamentous injury of the cervical spine
E) Vertebral artery stenosis

Correct Answer: E.

This patient likely has a stenosis of the left vertebral artery leading to vertebrobasilar insufficiency. Vertebrobasilar insufficiency refers to transient ischemic attacks (TIAs) of the vertebrobasilar territory (also known as the posterior circulation) and can be caused by stenosis secondary to atherosclerotic buildup, thromboembolism, or vertebral artery dissection. This patient possesses several risk factors for atherosclerosis, including smoking, hypertension, and diabetes mellitus. Neck rotation commonly alters blood flow in the vertebral artery and may lead to transient ischemia, especially in patients with existing vertebral artery stenosis. The vertebral artery supplies the brainstem, cerebellum, and occipital lobes. Patients typically present with transient vestibulocerebellar signs (ataxia, dysmetria, dizziness, imbalance, vertigo, vomiting, nystagmus), ipsilateral cranial nerve dysfunction (dysphagia, dysarthria, vertical or horizontal gaze palsies), contralateral hemiparesis (caused by corticospinal tract damage), contralateral impairment in pain and temperature sensation (caused by spinothalamic tract damage), and/or potential contralateral homonymous hemianopsia with macular sparing (as a result of occipital lobe involvement). In patients with vertebrobasilar insufficiency, secondary prevention of future TIAs or strokes should include smoking cessation, blood pressure reduction, blood glucose control, a healthy diet, regular exercise, and use of a statin and aspirin. This patient with subacutely increased neck pain may have experienced a vertebral artery dissection (with delayed onset of neurologic sequelae) and should immediately undergo CT angiography of the neck.

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Incorrect Answers: A, B, C, and D.

Carotid artery dissection (Choice A) may result in TIA or stroke in the internal carotid artery (ICA) territory. A cervical bruit may be present. The ICA supplies the anterior and middle cerebral arteries, which supply the anterior and medial frontal lobe (anterior cerebral) and the lateral frontal lobe, anterior parietal lobe, and temporal lobe (middle cerebral). Occlusion of the ICA or its branches therefore leads to contralateral hemiparesis and contralateral sensory deficit of the face and upper or lower extremities, symptoms inconsistent with this patient's presentation.

Cervical intervertebral disc disease (Choice B), also known as degenerative joint disease, may lead to herniation of a disc and consequent cervical radiculopathy or myelopathy. Cervical radiculopathy typically presents with neck pain that radiates to the upper extremity along with upper extremity numbness, paresthesia, and weakness. It does not typically present with vertigo or diplopia.

Glomus vagale tumor (Choice C) is a rare benign tumor arising from the vagus nerve. It typically presents as a painless neck mass and may cause difficulty swallowing, hoarseness, and cough. Vertigo and diplopia would be atypical.

Ligamentous injury of the cervical spine (Choice D) can lead to cervical spine instability and potential cervical spinal stenosis or cervical nerve root injury, leading to neurologic symptoms below the head. Damage of the cervical spine or nerve roots does not typically lead to vertigo or diplopia.

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Ligamentous injury of the cervical spine (Choice D) can lead to cervical spine instability and potential cervical spinal stenosis or cervical nerve root injury, leading to neurologic symptoms below the head. Damage of the cervical spine or nerve roots does not typically lead to vertigo or diplopia.

Educational Objective: Vertebral artery stenosis may lead to vertebrobasilar insufficiency, or TIAs in the vertebrobasilar vascular territory. Neck movement can alter vertebral artery blood flow and trigger symptoms. Patients commonly present with episodic vertebrobasilar symptoms, ipsilateral cranial nerve dysfunction, contralateral hemiparesis, and/or contralateral impairment in pain and temperature sensation.

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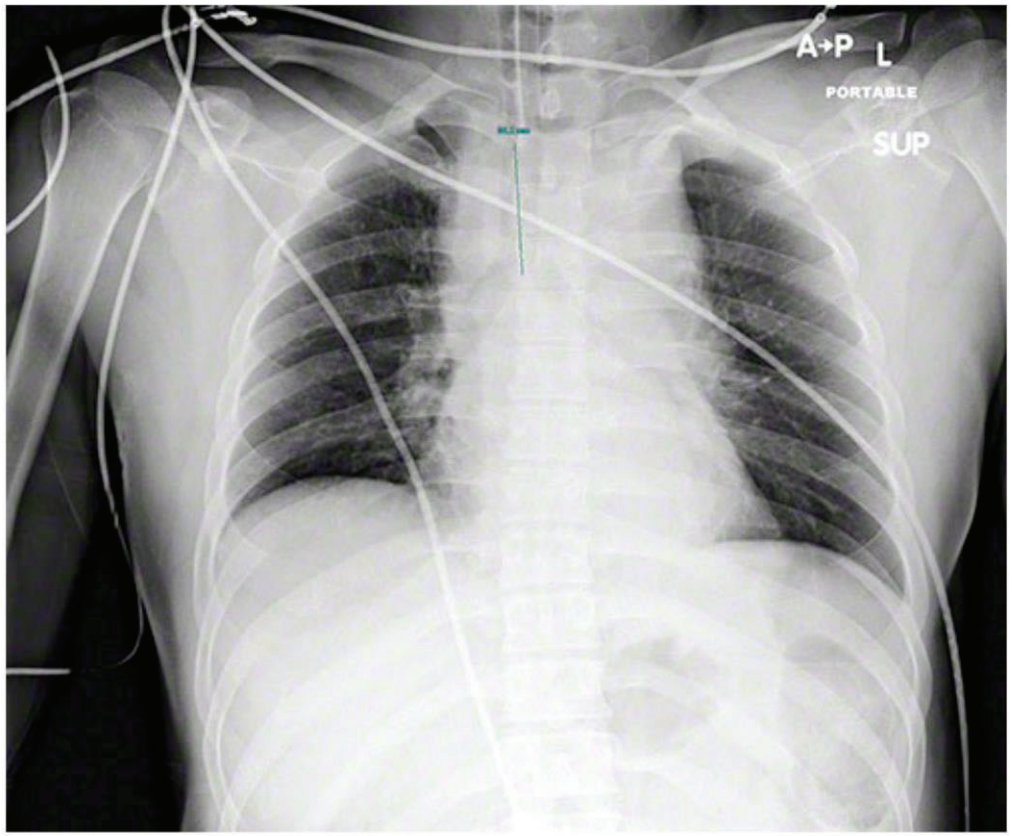

18. An 18-year-old man is brought to the emergency department (ED) 15 minutes after he was involved in a high-speed motor vehicle collision in which he was the unrestrained driver. The airbags did not deploy on impact. The patient was found unresponsive at the scene by emergency medical technicians, who intubated him prior to transport. On arrival at the ED, he remains unresponsive. Medical history and medications are unknown. Pulse is 100/min, respirations are 16/min, and blood pressure is 105/60 mm Hg. Pulse oximetry on an FIO_2 of 1.0 shows an oxygen saturation of 100%. Glasgow Coma Scale score is 3. Physical examination

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A) CT angiography of the chest
B) MRI of the right shoulder
C) Needle thoracostomy
D) Pericardiocentesis
E) Repeat chest x-ray with dedicated rib views

Correct Answer: A.

Traumatic dissection of the aorta can occur in deceleration injuries such as motor vehicle collisions or falls. Patients can present with tearing chest pain, hypotension, hemodynamic instability, and tachycardia. Many patients with complete transection or rupture of the aorta do not survive to evaluation and many decompensate abruptly. The gold standard of diagnosis involves CT angiography of the aorta; however, hypotensive patients may be too unstable to tolerate a CT scan. A chest x-ray can be obtained which may show a widened mediastinum as in this case. CT angiography of the chest can differentiate types of blunt aortic injury, including aortic dissection, aortic rupture, or pseudoaneurysm. Repair of traumatic dissection of the aorta can be done via open repair or endovascular repair. These patients are critically ill, and attention must be paid to hemodynamic support, reversal of coagulopathy if present, and surgical evaluation without delay for advanced imaging in cases of high pretest probability.

Incorrect Answers: B, C, D, and E.

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E) Repeat chest x-ray with dedicated rib views

Correct Answer: A.

Traumatic dissection of the aorta can occur in deceleration injuries such as motor vehicle collisions or falls. Patients can present with tearing chest pain, hypotension, hemodynamic instability, and tachycardia. Many patients with complete transection or rupture of the aorta do not survive to evaluation and many decompensate abruptly. The gold standard of diagnosis involves CT angiography of the aorta; however, hypotensive patients may be too unstable to tolerate a CT scan. A chest x-ray can be obtained which may show a widened mediastinum as in this case. CT angiography of the chest can differentiate types of blunt aortic injury, including aortic dissection, aortic rupture, or pseudoaneurysm. Repair of traumatic dissection of the aorta can be done via open repair or endovascular repair. These patients are critically ill, and attention must be paid to hemodynamic support, reversal of coagulopathy if present, and surgical evaluation without delay for advanced imaging in cases of high pretest probability.

Incorrect Answers: B, C, D, and E.

MRI of the right shoulder (Choice B) is typically done outpatient for the evaluation of rotator cuff injury and other chronic shoulder pain. It would not be appropriate in this hemodynamically tenuous patient after motor vehicle collision.

Needle thoracostomy (Choice C) would be helpful if this patient had a tension pneumothorax. Tension pneumothorax can be a complication of penetrating thoracic trauma and occurs when air is able to enter the pleural space but is prevented from exiting. Tension pneumothorax is characterized by absent breath sounds and hyperresonance to percussion on the affected side. Chest x-ray would show absence of lung markings on one side and may show tracheal and/or mediastinal deviation.

Pericardiocentesis (Choice D) would be indicated in cases of traumatic pericardial effusion causing cardiac tamponade. Tamponade presents with hypotension, jugular venous distention, distant heart sounds, and pulsus paradoxus. This patient has widened mediastinum on chest x-ray, making traumatic aortic injury more likely.

Repeat chest x-ray with dedicated rib views (Choice E) can be helpful in diagnosing rib fractures, but this patient's chest x-ray and presentation are concerning for traumatic aortic injury, necessitating emergent CT angiography of the chest. A CT scan of the chest is also sensitive for identifying and evaluating rib fractures.

Educational Objective: Traumatic dissection of the aorta can occur in sudden deceleration injuries and patients can present with chest pain and hemodynamic instability. Chest x-ray can show a widened mediastinum, whereas CT angiography of the chest is the gold standard for diagnosis.

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19. A 25-year-old woman at 32 weeks' gestation comes to the office because of a 1-month history of "pressure" under her eyes, persistent stuffy nose, and yellow-green nasal discharge. Her pregnancy has been uncomplicated. Temperature is 37.2°C (99.0°F), pulse is 82/min, and respirations are 16/min. Pulse oximetry on room air shows an oxygen saturation of 99%. Physical examination discloses tenderness to palpation over the cheeks. Which of the following is the most appropriate initial step in management for this patient?

A) Allergy testing
B) Antibiotic therapy
C) Antihistamine therapy
D) Sinus ostial dilation
E) Reassurance that colds tend to last longer during pregnancy

Correct Answer: B.

Acute bacterial sinusitis is a common problem that typically occurs following viral upper respiratory infection. Symptoms typically last for less than 1 month and include fever, malaise, fatigue, nasal congestion, purulent discharge, a feeling of sinus pressure or fullness, and dull pain that is aggravated by leaning forward. Pain may be elicited by percussion of the affected sinus. A minority of patients go on to develop subacute symptoms that may last up to 3 months. If symptoms persist for longer than 3 months, the term chronic bacterial sinusitis is preferred. While the vast majority of cases are uncomplicated, potential complications are serious and include orbital cellulitis, cavernous sinus thrombosis, and meningitis. The diagnosis is established based on a characteristic history and clinical examination; radiography and bacterial cultures are not necessary for uncomplicated cases. Acute bacterial sinusitis is typically a self-limited condition and the decision to pursue antibiotic therapy should be made on a case-by-case basis. The Infectious Disease Society of America (IDSA) 2012 Guidelines recommend a prescription of antibiotics for patients whose symptoms persist for longer than 7 to 10 days, those with fever, and those with worsening symptoms. However, a more recent multidisciplinary Clinical Practice Guideline from the American Academy of Otolaryngology – Head and Neck Surgery has suggested that select patients with good follow-up may be clinically observed without antibiotics. A short course (5 to 7 days) of amoxicillin with or without clavulanic acid is first-line for most patients. Patients who are pregnant should not be prescribed fluoroquinolones or tetracyclines.

Incorrect Answers: A, C, D, and E.

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Incorrect Answers: A, C, D, and E.

Allergy testing (Choice A) is helpful for patients with allergic rhinitis but is not helpful for patients with bacterial sinusitis. Allergic sinusitis presents with sneezing, rhinorrhea, and itching but does not typically present with purulent nasal discharge.

Antihistamine therapy (Choice C) may be a useful adjunctive therapy for patients with allergic rhinitis, although inhaled glucocorticoid sprays are considered first-line. Antihistamine therapy has little role in the treatment of bacterial sinusitis.

Sinus ostial dilation (Choice D) is a useful treatment for certain patients with chronic sinusitis, but it is not necessary for this patient with acute to subacute bacterial sinusitis who has not yet tried a course of antibiotics.

Reassurance that colds tend to last longer during pregnancy (Choice E) is incorrect. This patient's symptoms of sinus pain and purulent discharge for 4 weeks are suggestive of bacterial sinusitis, rather than the common cold.

Educational Objective: Acute bacterial sinusitis is a common problem that typically occurs following viral upper respiratory infection, and it presents with fever, malaise, fatigue, nasal congestion, purulent discharge, a feeling of sinus pressure or fullness, and dull pain that is aggravated by leaning forward. The decision to pursue antibiotic therapy, typically amoxicillin with or without clavulanic acid, should be made on a case-by-case basis.

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20. A 72-year-old man comes to the office because of a 2-year history of progressive shortness of breath that worsens with exertion. He also has a 1-year history of intermittent cough productive of whitish sputum, primarily in the morning; there is no blood. He has not had chest pain. He has hypertension and hyperlipidemia. His medications are chlorthalidone, felodipine, potassium chloride, and simvastatin. He has smoked one pack of cigarettes daily for 55 years. He is 183 cm (6 ft) tall and weighs 73 kg (160 lb); BMI is 22 kg/m^2. His temperature is 37°C (98.6°F), pulse is 76/min, respirations are 18/min, and blood pressure is 128/72 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 91%. Breath sounds are decreased bilaterally; the lungs otherwise are clear to auscultation. On cardiac examination, S_1 and S_2 are normal. A grade 2/6, systolic ejection murmur is heard at the upper right sternal border. There is trace pedal edema bilaterally; there is no cyanosis or clubbing. His hemoglobin concentration is 16 g/dL, and hematocrit is 49%. A chest x-ray shows no infiltrates or effusions. An ECG shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the chest
B) Echocardiography
C) Nuclear cardiac stress scintigraphy
D) Pulmonary function testing
E) Ventilation-perfusion lung scans

Correct Answer: D.

Pulmonary function testing is the best next step in diagnosis for this patient with progressive dyspnea on exertion, productive cough, and a history of cigarette smoking. Chronic obstructive pulmonary disease (COPD) is an obstructive lung disease characterized by decreased lung function from a combination of chronic bronchitis and/or emphysema, resulting in airflow obstruction on expiration. Physical examination shows decreased breath sounds as a result of decreased airflow and a prolonged expiratory phase as the pathologically narrowed airways are further compressed by positive intrathoracic pressure during expiration. Pulmonary function testing includes spirometry, full-body plethysmography, single-breath diffusing capacity, arterial blood gas analysis, and pulse oximetry. Spirometry is the most useful in diagnosing obstructive lung disease. The patient breathes into an external device (spirometer) which records the volume and rate of airflow during inspiration and expiration to generate a flow-volume loop. Obstruction is defined by a decrease in the ratio of the volume of air forcefully expelled in the first second of expiration (FEV_1) to the total volume of air expelled (FVC) during the expiratory phase (FEV_1/FVC). The severity of obstruction is graded by the amount of FEV_1 decrease compared with predicted values.

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Incorrect Answers: A, B, C, and E.

CT scan of the chest (Choice A) may be useful if pulmonary function testing is inconclusive. CT is more sensitive for parenchymal and bronchial lung disease than plain films.

Echocardiography (Choice B) may be considered as an additional diagnostic study to assess for evidence of pulmonary hypertension and right heart dysfunction in the setting of chronic lung disease. Evaluation with pulmonary function testing should be performed first.

Nuclear cardiac stress scintigraphy (Choice C) is used to evaluate cardiac perfusion for patients who have a contraindication to exercise stress testing. The patient does have risk factors for coronary artery disease; however, the presence of a productive cough, low-normal peripheral oxygen saturation, and normal ECG are more suggestive of chronic obstructive pulmonary disease.

Ventilation-perfusion lung scans (Choice E) can be used to assess for acute pulmonary embolism in patients with a contraindication to a contrast-enhanced CT study or to evaluate for evidence of chronic thromboembolic disease in the workup of pulmonary hypertension, if present.

Educational Objective: Pulmonary function testing is used to diagnose chronic obstructive pulmonary disease. Patients will display an obstructive spirometry pattern with a decreased FEV_1:FVC ratio. The severity of obstruction is graded by the decrease in FEV_1 compared with the predicted value.

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21. A 62-year-old woman comes to the emergency department because of a 3-hour history of right-sided chest pain. The pain is worse with coughing and deep breathing. She was discharged from rehabilitation 1 month ago after an uncomplicated left knee replacement. Her only medication is acetaminophen for pain. She is 165 cm (5 ft 5 in) tall and weighs 114 kg (252 lb); BMI is 42 kg/m^2. Her temperature is 37.5°C (99.5°F), pulse is 110/min, respirations are 20/min, and blood pressure is 126/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. Cardiac examination shows an accentuated S_2. The remainder of the examination shows no abnormalities except for limited range of motion of the left knee. A chest x-ray shows plate-like atelectasis in the right lower lung base. Which of the following is the most appropriate next step in diagnosis?

A) Serum D-dimer assay
B) Gram stain and culture of sputum
C) Spiral CT scan
D) Bronchoscopy with cytology
E) Pulmonary angiography

Correct Answer: C.

This patient presents with signs and symptoms of pleuritic chest pain, cough, hypoxia, and tachycardia. This constellation is suspicious for pulmonary embolism (PE). Pulmonary thromboembolism is a common disorder caused by occlusion of a pulmonary artery and impaired blood flow to a segment of lung. Risk factors include immobility, presence of deep venous thrombosis, obesity, recent surgery, pregnancy, use of oral contraceptives, smoking, trauma, fracture of long bones, and inherited thrombophilia disorders. PE presents with acute chest pain, shortness of breath, and hypoxia. Pulmonary emboli are often undetectable on chest x-ray, but large emboli with infarction can be seen on chest x-ray by secondary signs such as wedge-shaped areas of infarction or via the Westermark sign of unilateral oligemia. The next step in the diagnosis of PE involves CT angiography of the pulmonary arteries in cases of high pretest probability.

Incorrect Answers: A, B, D, and E.

Serum D-dimer assay (Choice A) is used to rule out PE in patients with a low to intermediate probability of PE, but this patient has a high probability of PE and should proceed directly to CT angiography.

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D) Bronchoscopy with cytology

E) Pulmonary angiography

Correct Answer: C.

This patient presents with signs and symptoms of pleuritic chest pain, cough, hypoxia, and tachycardia. This constellation is suspicious for pulmonary embolism (PE). Pulmonary thromboembolism is a common disorder caused by occlusion of a pulmonary artery and impaired blood flow to a segment of lung. Risk factors include immobility, presence of deep venous thrombosis, obesity, recent surgery, pregnancy, use of oral contraceptives, smoking, trauma, fracture of long bones, and inherited thrombophilia disorders. PE presents with acute chest pain, shortness of breath, and hypoxia. Pulmonary emboli are often undetectable on chest x-ray, but large emboli with infarction can be seen on chest x-ray by secondary signs such as wedge-shaped areas of infarction or via the Westermark sign of unilateral oligemia. The next step in the diagnosis of PE involves CT angiography of the pulmonary arteries in cases of high pretest probability.

Incorrect Answers: A, B, D, and E.

Serum D-dimer assay (Choice A) is used to rule out PE in patients with a low to intermediate probability of PE, but this patient has a high probability of PE and should proceed directly to CT angiography.

Gram stain and culture of sputum (Choice B) is helpful in the diagnosis of pneumonia. Pneumonia typically presents with fever, productive cough, and an infiltrate on chest x-ray.

Bronchoscopy with cytology (Choice D) allows direct visualization of the lung airways and is helpful in the diagnosis of lung cancer. This patient's symptoms are acute and more likely caused by pulmonary embolism than a chronic process such as cancer.

Pulmonary angiography (Choice E) refers to the invasive catheter angiographic evaluation of the pulmonary arteries. This is no longer necessary for the diagnosis of PE given advances in ventilation-perfusion scans and CT pulmonary angiography but may still be performed during pulmonary embolectomy.

Educational Objective: PE can present with acute pleuritic chest pain, cough, hemoptysis, shortness of breath, tachycardia, and hypoxia. Diagnosis of PE is most commonly made via CT angiography of the pulmonary arteries.

22. A 37-year-old man comes to the physician for a follow-up examination 3 weeks after being diagnosed with hepatitis C. He has a long-standing history of intravenous heroin use. He is currently receiving methadone therapy for heroin addiction. He has smoked one and a half packs of cigarettes daily for 20 years and drinks seven glasses of wine weekly. Examination shows no abnormalities. Serum assays are positive for hepatitis B antibody and negative for hepatitis B antigen. Which of the following is the most appropriate recommendation to minimize the progression of liver disease in this patient?

A) Abstinence from alcohol
B) Smoking cessation
C) Lamivudine (3TC) therapy
D) Discontinue methadone as a treatment option for heroin addiction
E) Hepatitis B vaccine

Correct Answer: A.

Abstinence from alcohol would best minimize this patient's progression of liver disease. The patient reports drinking seven glasses of wine weekly. While this is below the recommended upper limit of 14 drinks weekly for a normal male patient, because of this patient's recent diagnosis of hepatitis C, he should completely abstain from alcohol consumption. The consumption of alcoholic beverages along with a history of chronic hepatitis C results in an approximate two to three times increased risk for developing cirrhosis and eight times increased risk of hepatocellular carcinoma relative to patients with chronic hepatitis C that do not consume alcoholic beverages. The standard of care for the treatment of hepatitis C infection is the administration of combination anti-viral therapy such as ledipasvir-sofosbuvir or glecaprevir-pibrentasvir, among others. These anti-viral medications are associated with a 95 to 99% cure rate. In the absence of available anti-viral therapy for the patient, whether as a result of a lack of availability or the patient's therapeutic decisions, the most appropriate recommendation for the patient to minimize his progression to liver disease is to abstain from any alcohol consumption.

Incorrect Answers: B, C, D, and E.

Smoking cessation (Choice B) would benefit this patient's overall health, including reducing his risk for future pulmonary and cardiovascular disease. It is not believed to play a role in the risk of future liver disease.

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recommended upper limit of 14 drinks weekly for a normal male patient, because of this patient's recent diagnosis of hepatitis C, he should completely abstain from alcohol consumption. The consumption of alcoholic beverages along with a history of chronic hepatitis C results in an approximate two to three times increased risk for developing cirrhosis and eight times increased risk of hepatocellular carcinoma relative to patients with chronic hepatitis C that do not consume alcoholic beverages. The standard of care for the treatment of hepatitis C infection is the administration of combination anti-viral therapy such as ledipasvir-sofosbuvir or glecaprevir-pibrentasvir, among others. These anti-viral medications are associated with a 95 to 99% cure rate. In the absence of available anti-viral therapy for the patient, whether as a result of a lack of availability or the patient's therapeutic decisions, the most appropriate recommendation for the patient to minimize his progression to liver disease is to abstain from any alcohol consumption.

Incorrect Answers: B, C, D, and E.

Smoking cessation (Choice B) would benefit this patient's overall health, including reducing his risk for future pulmonary and cardiovascular disease. It is not believed to play a role in the risk of future liver disease.

Lamivudine (3TC) therapy (Choice C) is an effective anti-viral medication used for the treatment of chronic hepatitis B, and also for the management of HIV/AIDS in combination with other anti-retroviral therapy. This patient's serum assays demonstrate the presence of hepatitis B antibody, indicating immunity from hepatitis B, either from a prior infection or immunization.

Discontinue methadone as a treatment option for heroin addiction (Choice D) would not be appropriate for this patient. Methadone is a long-acting opioid agonist that is used for the treatment of opioid addiction. Its side effect profile is similar to other opioid medications, including sedation, nausea, vomiting, and potential severe respiratory depression with overdose. It does not affect the progression of liver disease.

Hepatitis B vaccine (Choice E) is unnecessary for this patient as his serum assays demonstrate the presence of hepatitis B antibody and absence of hepatitis B antigen. This indicates the patient does not have an active hepatitis B infection, but rather has immunity secondary to either a prior infection or immunization.

Educational Objective: The consumption of alcohol along with a history of chronic hepatitis C infection results in a markedly increased risk of developing cirrhosis and hepatocellular carcinoma. The standard of care for a hepatitis C infection is the administration of combination anti-viral therapy. In addition to these medications or in the absence of available anti-viral therapy, the most important recommendation to minimize the progression of liver disease in a patient with hepatitis C is to abstain from any alcohol consumption.

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23. A 47-year-old woman comes to the physician for a follow-up examination. Two weeks ago, she underwent laparoscopic Nissen fundoplication for Barrett esophagus secondary to gastroesophageal reflux disease. Since the operation, she has had upper abdominal bloating after eating. She also has had a sensation of meat sticking in her esophagus that resolves spontaneously after 1 hour. She has been unable to burp or vomit to relieve her discomfort. She has been following an unrestricted diet. She has not had any changes in bowel habits. Current medications include oxycodone-acetaminophen. She appears well. Her temperature is 36.8°C (98.2°F), pulse is 76/min, respirations are 14/min, and blood pressure is 116/78 mm Hg. Examination shows well-healing surgical incisions with mild tenderness to palpation. The abdomen is scaphoid with no masses. Which of the following is the most appropriate next step in management?

A) Dietary modification
B) Abdominal x-rays
C) Treatment with a prokinetic agent
D) Treatment with a proton pump inhibitor
E) Biopsy of the distal esophagus
F) Esophageal dilatation
G) Esophagomyotomy

Correct Answer: A.

Nissen fundoplication is a commonly employed technique for the treatment of gastroesophageal reflux disease (GERD) and hiatal hernia in which the gastric fundus is plicated, or wrapped, around the esophagus to reinforce the lower esophageal sphincter. Frequent adverse effects of Nissen fundoplication include dysphagia and gas bloat syndrome, in which the impaired ability to clear gas from the stomach lumen results in symptoms of bloating and discomfort. The incidence of these adverse effects is increased when a proper postoperative diet is not adhered to. Patients who undergo Nissen fundoplication should have their diet carefully advanced from liquids to a soft diet. Consuming several smaller meals is also helpful. Particular foods, such as red meat, bread, raw vegetables, and dry or crunchy foods should be avoided. Symptoms of gas bloat are typically self-limited and resolve after several weeks.

Incorrect Answers: B, C, D, E, F, and G.

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bloat syndrome, in which the impaired ability to clear gas from the stomach lumen results in symptoms of bloating and discomfort. The incidence of these adverse effects is increased when a proper postoperative diet is not adhered to. Patients who undergo Nissen fundoplication should have their diet carefully advanced from liquids to a soft diet. Consuming several smaller meals is also helpful. Particular foods, such as red meat, bread, raw vegetables, and dry or crunchy foods should be avoided. Symptoms of gas bloat are typically self-limited and resolve after several weeks.

Incorrect Answers: B, C, D, E, F, and G.

Abdominal x-rays (Choice B) are of limited utility in the evaluation of GERD or of the complications of fundoplication procedures. Barium swallow is a more useful study for this purpose.

Treatment with a prokinetic agent (Choice C), such as metoclopramide, is not necessary. Proper dietary modification is usually adequate for the treatment of symptoms.

Treatment with a proton pump inhibitor (Choice D) is unnecessary following fundoplication surgery. Patients who have undergone fundoplication may usually stop using proton pump inhibitors.

Biopsy of the distal esophagus (Choice E) is useful for the evaluation of suspected esophageal carcinoma. This patient's history of recent fundoplication surgery is suggestive of dysphagia and gas bloat secondary to her surgery, rather than carcinoma.

Esophageal dilatation (Choice F) may be performed with a pneumatic balloon to treat achalasia or peptic stricture. It is not useful for the treatment of gas bloat syndrome and would be relatively contraindicated after fundoplication.

Esophagomyotomy (Choice G) is a surgical technique for the treatment of achalasia, in which the muscular fibers of the lower esophageal sphincter are weakened. It may be performed from an external laparoscopic approach, as in the Heller myotomy procedure, or through an endoscopic approach. It is not indicated in the treatment of gas bloat following Nissen fundoplication.

Educational Objective: Nissen fundoplication is a commonly employed technique for the treatment of gastroesophageal reflux and hiatal hernia in which the gastric fundus is plicated, or wrapped, around the esophagus to reinforce the lower esophageal sphincter. Frequent adverse effects of Nissen fundoplication include dysphagia and gas bloat syndrome. Careful diet advancement can decrease the incidence of these adverse effects.

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24. A 53-year-old man with alcoholism comes to the physician because of a 5-month history of loose stools and persistent swelling of his ankles. He is otherwise asymptomatic. He drinks "at least a pint" of bourbon daily. Vital signs are within normal limits. Cardiopulmonary examination shows no abnormalities. Abdominal examination shows distention and a positive fluid wave. Laboratory studies show:

Mean corpuscular volume	108 μm^3
Serum	
Urea nitrogen	7 mg/dL
Creatinine	0.9 mg/dL
Albumin	2.9 g/dL
Total bilirubin	1.6 mg/dL
AST	64 U/L
ALT	74 U/L

Additional laboratory studies are most likely to show which of the following serum electrolyte concentrations?

	Na^+ (mEq/L)	K^+ (mEq/L)
A)	132	3.1
B)	132	4.9
C)	140	4
D)	148	3.1
E)	148	4.9

Correct Answer: A.

Cirrhosis is associated with a variety of hormonal and electrolyte perturbations, including of vasodilatory substances such as prostaglandins. Excessive production of prostaglandins results in systemic vasodilation, leading both to the formation of ascites as well as release of antidiuretic hormone (ADH). The release of ADH leads to free

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A)	132	3.1
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C)	140	4
D)	148	3.1
E)	148	4.9

Correct Answer: A.

Cirrhosis is associated with a variety of hormonal and electrolyte perturbations, including of vasodilatory substances such as prostaglandins. Excessive production of prostaglandins results in systemic vasodilation, leading both to the formation of ascites as well as release of antidiuretic hormone (ADH). The release of ADH leads to free water retention with resultant hyponatremia. Potassium disturbances, most commonly hypokalemia, may also result from vomiting, diarrhea, or the use of diuretics. Treatment of hyponatremia in patients with cirrhosis is directed toward improving systemic perfusion, typically with a combination of midodrine and withdrawal of vasodilatory drugs (eg, β-adrenergic blockers), and correction of underlying hypokalemia.

Incorrect Answers: B, C, D, and E.

Choice B corresponds to hyponatremia and borderline hyperkalemia. While hyponatremia is common in cirrhosis, hypokalemia is more common than hyperkalemia especially in the setting of alcohol abuse without renal dysfunction.

Choice C corresponds to normal serum concentrations of sodium and potassium. While some patients with cirrhosis lack electrolyte disturbances, the majority of patients with cirrhosis display some degree of hyponatremia.

Choice D and Choice E correspond to hypernatremia with concomitant hypokalemia and borderline hyperkalemia, respectively. Hypernatremia may be encountered in patients with cirrhosis in the setting of volume depletion, typically as a result of diuresis or the use of lactulose. This is less common than hyponatremia and hypokalemia.

Educational Objective: Cirrhosis is associated with an increased production of vasodilatory compounds that lead to the release of antidiuretic hormone, retention of free water, and hyponatremia. Hypokalemia often occurs from gastrointestinal losses from vomiting or diarrhea.

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25. A previously healthy 6-year-old boy is brought to the emergency department because of cramping abdominal pain and right-sided scrotal pain for 4 hours. He vomited once on the way to the hospital. Examination shows a distended abdomen. Bowel sounds are decreased, and there is diffuse tenderness to palpation with involuntary guarding. The right hemiscrotum is slightly discolored with swelling and tenderness superiorly. The left hemiscrotum is normal; the testicle is normal. Which of the following is the most appropriate next step in management?

A) Transillumination of scrotum
B) Valsalva maneuver
C) Urinalysis
D) Doppler ultrasonography
E) CT scan
F) Antibiotic therapy
G) Operative procedure

Correct Answer: G.

Inguinal hernias occur secondary to weakness in the muscle and connective tissue of the anterior abdominal wall and are classified as direct or indirect depending on their relationship to the Hesselbach triangle. Hernia contents can include preperitoneal fat or may contain intra-abdominal contents such as small bowel, omentum, peritoneum, or large bowel. Many hernias are easily reducible and asymptomatic; however, if the hernia contents become incarcerated within the hernia sac or if strangulation occurs impeding blood supply, a surgical emergency arises. A strangulated hernia presents with severe pain in the hernia site, often with overlying reactive erythema, fever, and a tender, irreducible mass on examination. In extremis, sepsis and septic shock can arise from necrotic bowel. If a hernia cannot be manually reduced, surgical reduction is required in the setting of acute symptoms to prevent life-threatening complications. Treatment when such cases occur includes immediate surgical exploration and hernia reduction, intravenous fluids, antibiotics, and bowel rest.

Incorrect Answers: A, B, C, D, E, and F

Transillumination of the scrotum (Choice A) is a useful technique for the diagnosis of hydrocele. Hydroceles are fluid-filled sacs within the scrotum that are nontender, non

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or large bowel. Many hernias are easily reducible and asymptomatic; however, if the hernia contents become incarcerated within the hernia sac or if strangulation occurs impeding blood supply, a surgical emergency arises. A strangulated hernia presents with severe pain in the hernia site, often with overlying reactive erythema, fever, and a tender, irreducible mass on examination. In extremis, sepsis and septic shock can arise from necrotic bowel. If a hernia cannot be manually reduced, surgical reduction is required in the setting of acute symptoms to prevent life-threatening complications. Treatment when such cases occur includes immediate surgical exploration and hernia reduction, intravenous fluids, antibiotics, and bowel rest.

Incorrect Answers: A, B, C, D, E, and F

Transillumination of the scrotum (Choice A) is a useful technique for the diagnosis of hydrocele. Hydroceles are fluid-filled sacs within the scrotum that are nontender, non-nodular, and transilluminate on examination. They do not cause severe pain or symptoms of bowel obstruction.

Valsalva maneuver (Choice B) increases intra-abdominal pressure and is often a trigger for the herniation of abdominal contents into the inguinal canal. It is not a useful technique for the reduction of an inguinal hernia.

Urinalysis (Choice C) is useful for the diagnosis of urinary tract infection. It plays no role in the diagnosis of an incarcerated or strangulated inguinal hernia.

Doppler ultrasonography (Choice D) is useful for the diagnosis of testicular torsion. Testicular torsion occurs when the testicle twists on the spermatic cord resulting in testicular ischemia. Patients typically present with acute, severe testicular pain, swelling, and erythema. The presence of abdominal distention and tenderness, as well as decreased bowel sounds, is suggestive of bowel obstruction and is not consistent with a diagnosis of testicular torsion.

CT scan (Choice E) may be useful for confirming the presence of herniated abdominal contents. However, this is unnecessary in making the diagnosis and will lead to a delay in surgical treatment with a resultant increase in the risk for bowel necrosis.

Antibiotic therapy (Choice F) is useful for the treatment of epididymitis and orchitis but is not helpful for the management of an incarcerated or strangulated inguinal hernia.

Educational Objective: Most inguinal hernias are easily reducible and asymptomatic. Entrapment of small bowel, omentum, peritoneum, or large bowel may lead to intestinal obstruction and may result in incarceration or strangulation of the entrapped tissue. Immediate surgical exploration and hernia reduction is indicated to prevent life-threatening complications, including bowel necrosis, sepsis, and septic shock.

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26. A 56-year-old man with claudication is scheduled for angiography of the right femoral artery. He has hypertension and type 2 diabetes mellitus treated with insulin. He smoked two packs of cigarettes daily for 30 years until he stopped 5 years ago. He has no history of allergy to radiopaque contrast agents. He has proteinuria secondary to diabetes. Before angiography, which of the following should be administered to prevent further renal injury?

A) Captopril
B) Corticosteroids
C) Diphenhydramine
D) Increased dose of insulin
E) 0.9% Saline

Correct Answer: E.

Contrast nephropathy is a potential risk of contrast administration and is greatest in patients with risk factors including diabetes mellitus and chronic kidney disease (CKD), particularly CKD secondary to diabetes. The mechanism by which contrast nephropathy occurs is unclear but is most commonly thought to be a result of vasoconstriction and renal tubular ischemia leading to acute tubular necrosis. The risk for acute kidney injury is directly related to the volume of contrast administered (and is therefore greatest in interventional procedures and in angiography, as in this case), the route of administration, and the severity of the patient's underlying renal dysfunction. The most important component of prophylaxis against contrast nephropathy is administration of normal saline prior to, during, and after the administration of contrast. Contrast nephropathy is typically a self-limited condition and resolves after several days, with a return of creatinine to normal baseline values in most patients.

Incorrect Answers: A, B, C, and D.

Captopril (Choice A) is an angiotensin-converting enzyme (ACE) inhibitor. The effect of ACE inhibitors on the development of contrast nephropathy is currently unclear. While ACE inhibitors are associated with nephrotoxicity, they also lead to vasodilation, which has been suggested to be protective in the setting of contrast administration. The utility of either administering or withholding ACE inhibitors prior to the administration of contrast is not currently supported by high-quality evidence.

Corticosteroids (Choice B) have not been demonstrated to decrease the risk for contrast nephropathy and are associated with significant adverse effects.

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D) Increased dose of insulin

E) 0.9% Saline

Correct Answer: E.

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Corticosteroids (Choice B) have not been demonstrated to decrease the risk for contrast nephropathy and are associated with significant adverse effects.

Diphenhydramine (Choice C) is useful for the treatment of allergies to intravenous contrast, but its administration is not known to decrease the risk for developing contrast nephropathy, which is not thought to occur by an allergic mechanism.

Increasing the dose of insulin (Choice D) is not necessary. While diabetic patients are at increased risk for contrast nephropathy, it is not clear that increasing the dose of insulin in the immediate period prior to the administration of contrast is beneficial.

Educational Objective: Contrast nephropathy is a risk of contrast administration and is greatest in patients with risk factors including diabetes mellitus and CKD secondary to diabetes. The most important component of prophylaxis against contrast nephropathy is the administration of normal saline prior to, during, and after the administration of contrast.

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27. A 2-year-old girl is brought to the physician by her father because of a 4-day history of vomiting and diarrhea. The patient has not voided urine during the past 24 hours. She has no history of serious illness and receives no medications. Immunizations are up-to-date. She appears tired but not in distress. Her pulse is 120/min, respirations are 24/min, and blood pressure is 110/60 mm Hg. Examination shows dry mucous membranes. No other abnormalities are noted. Laboratory studies are most likely to show which of the following findings?

A) Red blood cell casts
B) Serum potassium concentration of 6 mg/dL
C) Urine fractional excretion of sodium equal to 0.5%
D) Urine osmolality of 300 mOsmol/kg H_2O
E) Urine specific gravity of 1.010

Correct Answer: C.

This child presents with risk factors for volume depletion and prerenal acute kidney injury (AKI). Common causes of prerenal AKI include hypovolemia (such as in this case, where it occurs secondary to gastrointestinal illness and volume loss through vomiting and diarrhea), sepsis, hypotension, and cardiogenic shock. Prerenal azotemia refers to an AKI secondary to decreased renal blood flow, which results in a decreased glomerular filtration rate (GFR), typically in the setting of hypovolemia, hypotension, or renal hypoperfusion. In response to the decreased renal blood flow, renin and angiotensin are upregulated, which stimulates increased absorption of sodium in the proximal convoluted tubule. This leads to decreased fractional excretion of sodium (<1%). The decreased GFR results in decreased tubular flow rate, which consequently leads to increased urea nitrogen reabsorption, although creatinine is unable to be reabsorbed by the renal tubules. This results in an increased blood urea nitrogen to creatinine ratio, typically greater than 20. Treatment of prerenal azotemia requires treatment of the underlying cause of decreased renal blood flow. If untreated, this can progress to worsening AKI and possible intrinsic renal failure.

Incorrect Answers: A, B, D, and E.

Red blood cell casts (Choice A) are often seen in the setting of acute glomerulonephritis. They are not typically encountered in hypovolemia and prerenal AKI.

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E) Urine specific gravity of 1.010

Correct Answer: C.

This child presents with risk factors for volume depletion and prerenal acute kidney injury (AKI). Common causes of prerenal AKI include hypovolemia (such as in this case, where it occurs secondary to gastrointestinal illness and volume loss through vomiting and diarrhea), sepsis, hypotension, and cardiogenic shock. Prerenal azotemia refers to an AKI secondary to decreased renal blood flow, which results in a decreased glomerular filtration rate (GFR), typically in the setting of hypovolemia, hypotension, or renal hypoperfusion. In response to the decreased renal blood flow, renin and angiotensin are upregulated, which stimulates increased absorption of sodium in the proximal convoluted tubule. This leads to decreased fractional excretion of sodium (<1%). The decreased GFR results in decreased tubular flow rate, which consequently leads to increased urea nitrogen reabsorption, although creatinine is unable to be reabsorbed by the renal tubules. This results in an increased blood urea nitrogen to creatinine ratio, typically greater than 20. Treatment of prerenal azotemia requires treatment of the underlying cause of decreased renal blood flow. If untreated, this can progress to worsening AKI and possible intrinsic renal failure.

Incorrect Answers: A, B, D, and E.

Red blood cell casts (Choice A) are often seen in the setting of acute glomerulonephritis. They are not typically encountered in hypovolemia and prerenal AKI.

Serum potassium concentration of 6 mg/dL (Choice B), or hyperkalemia, is unlikely to result from hypovolemia alone. Hyperkalemia commonly occurs in renal insufficiency, aldosterone deficiency, and renal tubular acidosis.

Urine osmolality of 300 mOsmol/kg H_2O (Choice D) represents a low-normal urine osmolality, which may be observed in the setting of volume excess or intrinsic renal dysfunction. Hypovolemia is typically accompanied by an increased urine osmolality.

Urine specific gravity of 1.010 (Choice E) represents a normal urine specific gravity. Specific gravity is a measure of the concentration of excreted compounds in the urine. Patients with hypovolemia typically have an increased urinary specific gravity.

Educational Objective: Hypovolemia may occur secondary to gastrointestinal illness and may lead to prerenal acute kidney injury. Prerenal acute kidney injury may be identified by a decreased fractional excretion of sodium (<1%) and by an increased ratio of blood urea nitrogen to creatinine (>20).

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28. A 29-year-old woman, gravida 2, para 1, at 32 weeks' gestation is brought to the emergency department 30 minutes after cutting her left index finger while cooking. She has been applying pressure, but the bleeding has not stopped. She has no history of serious illness, and her only medication is a prenatal vitamin. Vaccinations were up-to-date at the birth of her first child 14 months ago. The patient's vital signs, including oxygen saturation, are within normal limits. Examination shows a 2-cm superficial laceration over the left index finger. Fetal heart tones are normal. The remainder of the examination shows no abnormalities. The laceration is sutured. Which of the following is the most appropriate vaccine to administer at this time?

A) Human papillomavirus
B) Inactivated influenza virus
C) Measles-mumps-rubella
D) Tetanus-diphtheria-acellular pertussis (Tdap)
E) No vaccine is indicated at this time

Correct Answer: D.

Routine immunizations indicated during pregnancy include the inactivated influenza virus vaccine and the tetanus-diphtheria-acellular pertussis (Tdap) vaccine. The Tdap vaccine is typically administered between 27 and 36 weeks' gestation to optimize maternal antibody response and promote placental transfer of antibodies to the fetus. Before infants receive their own DTaP vaccine at age 2 months, maternal Tdap vaccines protect infants against neonatal tetanus and pertussis, which are associated with significant mortality. To protect infants, patients should receive the Tdap each pregnancy (even if the pregnancies occur within the same year). Regardless of gestational age, if a pregnant patient acquires a wound and has not yet received a routine Tdap during the current pregnancy, standard wound management measures should be adopted (eg, Tdap vaccination in patients with minor wounds who have not received Tdap within the past 10 years). However, this patient at 32 weeks' gestation should receive the Tdap vaccine because of the routine pregnancy indication rather than wound management (since she has received the Tdap vaccine within 10 years).

Incorrect Answers: A, B, C, and E.

The human papillomavirus (Choice A) vaccine is not typically administered during pregnancy because of inadequate safety data.

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B) Inactivated influenza virus
C) Measles-mumps-rubella
D) Tetanus-diphtheria-acellular pertussis (Tdap)
E) No vaccine is indicated at this time

Correct Answer: D.

Routine immunizations indicated during pregnancy include the inactivated influenza virus vaccine and the tetanus-diphtheria-acellular pertussis (Tdap) vaccine. The Tdap vaccine is typically administered between 27 and 36 weeks' gestation to optimize maternal antibody response and promote placental transfer of antibodies to the fetus. Before infants receive their own DTaP vaccine at age 2 months, maternal Tdap vaccines protect infants against neonatal tetanus and pertussis, which are associated with significant mortality. To protect infants, patients should receive the Tdap each pregnancy (even if the pregnancies occur within the same year). Regardless of gestational age, if a pregnant patient acquires a wound and has not yet received a routine Tdap during the current pregnancy, standard wound management measures should be adopted (eg, Tdap vaccination in patients with minor wounds who have not received Tdap within the past 10 years). However, this patient at 32 weeks' gestation should receive the Tdap vaccine because of the routine pregnancy indication rather than wound management (since she has received the Tdap vaccine within 10 years).

Incorrect Answers: A, B, C, and E.

The human papillomavirus (Choice A) vaccine is not typically administered during pregnancy because of inadequate safety data.

The inactivated influenza virus (Choice B) vaccine may be indicated if it is influenza season. Regardless of the season, this patient requires a routine Tdap vaccine.

Measles-mumps-rubella (Choice C) should not be administered during pregnancy because of the theoretical risk that a live vaccine may cause the infant to contract the disease (eg, congenital rubella syndrome).

No vaccine (Choice E) would be inappropriate. Pregnant patients require routine Tdap vaccination.

Educational Objective: The Tdap vaccine is routinely administered between 27 and 36 weeks' gestation to optimize maternal antibody response and promote placental transfer of antibodies to the fetus to prevent neonatal tetanus and pertussis. Tdap vaccination should occur during each pregnancy.

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29. A 30-year-old primigravid woman at 26 weeks' gestation comes to the office for a routine prenatal visit. Her pregnancy has been complicated by first-trimester vaginal bleeding. She is otherwise healthy and takes no medications. Her pulse is 90/min, respirations are 20/min, and blood pressure is 100/72 mm Hg. Examination shows a fundal height of 27 cm. The fetal heart rate is 150/min. Laboratory studies show:

Hematocrit	33%
Leukocyte count	9500/mm^3
Platelet count	220,000/mm^3
Blood group	O, Rh-negative
1-Hour glucose tolerance test	120 mg/dL (N<135)
Serum anti-D antibody screening	positive 1:8

The blood group of the fetus's father is unknown. Which of the following is the most likely diagnosis?

A) Duffy sensitization
B) Folic acid deficiency
C) Gestational diabetes
D) Iron deficiency anemia
E) Rh isoimmunization

Correct Answer: E.

Rh(D)-negative mothers are at a high risk for developing anti-Rh(D) antibodies if exposed to blood from a Rh(D)-positive fetus, which most commonly occurs during delivery but can also occur earlier in pregnancy with vaginal bleeding or interventions such as amniocentesis. If Rh(D) antigens from the fetal circulation enter the maternal circulation, it is possible that the mother's immune system will form antibodies against the Rh(D) antigen. While this carries no significant complication with the initial exposure (if it occurs during delivery), a subsequent pregnancy with an Rh(D)-positive fetus can result in severe hemolytic anemia of the newborn (erythroblastosis fetalis) since maternal antibodies cause hemolysis of fetal erythrocytes when they cross the placenta. Rh_o(D) immune globulin (RhoGAM) acts by binding to Rh(D)-positive cells that enter the maternal circulation, preventing the immune system from developing antibodies to the Rh(D) antigen. Administration of Rh (D) immune globulin is typically

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C) Gestational diabetes

D) Iron deficiency anemia

E) Rh isoimmunization

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Duffy sensitization (Choice A) is a similar phenomenon as Rh isoimmunization. It occurs as a result of exposure of the immune system to the red blood cell antigen Duffy protein when it is not present on the patient's cells. The mother can be exposed to Duffy in a similar manner as Rh, and it can also cause hemolytic anemia of the newborn.

Folic acid deficiency (Choice B) can cause macrocytic anemia in pregnant patients and is associated with neural tube defects such as spina bifida in the newborn. Other risk factors include alcoholism, malabsorption, and use of folate antagonists. Symptoms include pallor, light-headedness, and shortness of breath. This patient's hematocrit is only minorly decreased, making folic acid deficiency unlikely.

Gestational diabetes (Choice C) is caused by increased insulin resistance and is commonly diagnosed in the prenatal period with a glucose tolerance test. A glucose tolerance test is considered positive when the blood glucose concentration is greater than 130 to 140 mg/dL 1 hour after a 50-g glucose load. This patient's blood glucose is 120 mg/dL, making gestational diabetes unlikely.

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exposure (if it occurs during delivery), a subsequent pregnancy with an Rh(D)-positive fetus can result in severe hemolytic anemia of the newborn (erythroblastosis fetalis) since maternal antibodies cause hemolysis of fetal erythrocytes when they cross the placenta. Rh_o(D) immune globulin (RhoGAM) acts by binding to Rh(D)-positive cells that enter the maternal circulation, preventing the immune system from developing antibodies to the Rh(D) antigen. Administration of Rh_o(D) immune globulin is typically performed for Rh(D)-negative mothers at 28 weeks' gestation, as well as following the delivery of an Rh(D)-positive newborn, any invasive procedure (eg, amniocentesis), and any confirmed or potential episodes of fetomaternal bleeding. Rh_o(D) immune globulin is ineffective in a patient who has already developed Rh(D) antibodies. This patient has likely developed Rh isoimmunization in the setting of her vaginal bleeding, placing her fetus at risk for hydrops fetalis and death.

Incorrect Answers: A, B, C, and D.

Duffy sensitization (Choice A) is a similar phenomenon as Rh isoimmunization. It occurs as a result of exposure of the immune system to the red blood cell antigen Duffy protein when it is not present on the patient's cells. The mother can be exposed to Duffy in a similar manner as Rh, and it can also cause hemolytic anemia of the newborn.

Folic acid deficiency (Choice B) can cause macrocytic anemia in pregnant patients and is associated with neural tube defects such as spina bifida in the newborn. Other risk factors include alcoholism, malabsorption, and use of folate antagonists. Symptoms include pallor, light-headedness, and shortness of breath. This patient's hematocrit is only minorly decreased, making folic acid deficiency unlikely.

Gestational diabetes (Choice C) is caused by increased insulin resistance and is commonly diagnosed in the prenatal period with a glucose tolerance test. A glucose tolerance test is considered positive when the blood glucose concentration is greater than 130 to 140 mg/dL 1 hour after a 50-g glucose load. This patient's blood glucose is 120 mg/dL, making gestational diabetes unlikely.

Iron deficiency anemia (Choice D) can cause microcytic anemia, characterized by pallor, fatigue, and light-headedness. It is a common cause of anemia in pregnancy, but this patient's hematocrit is only slightly decreased, making significant iron deficiency anemia unlikely.

Educational Objective: Rh(D)-negative mothers are at a high risk for Rh(D) alloimmunization when exposed to Rh(D) antigens from the fetal circulation. This can occur during delivery, invasive procedures (eg, amniocentesis), and episodes of fetomaternal bleeding. These patients develop Rh(D) antibodies, which can cause severe hemolytic anemia of the newborn, hydrops fetalis, and fetal death. While RhoGAM can prevent the development of Rh(D) antibodies, it is ineffective in a patient who has already developed antibodies.

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30. A 37-year-old woman, gravida 2, para 1, at 15 weeks' gestation comes to the physician for her first prenatal visit. She has felt well except for mild nausea for the past 4 weeks. She delivered a healthy newborn 5 years ago; pregnancy and delivery were uncomplicated. She has no history of serious illness or operative procedures. Physical examination shows no abnormalities. The uterus is consistent in size with a 13-week gestation. The patient inquires about amniocentesis but is concerned about any adverse effects. If this patient undergoes amniocentesis, she is at increased risk for which of the following complications?

A) Abruptio placentae
B) Meconium in the amniotic fluid
C) Polyhydramnios
D) Premature rupture of membranes
E) Uterine rupture

Correct Answer: D.

Amniocentesis is an invasive sampling of amniotic fluid through the abdominal wall, usually performed at 15 to 18 weeks' gestation. It may be considered after an abnormal prenatal quad screen to detect chromosomal abnormalities by a genetic analysis of the amniotic fluid. It is also commonly recommended when ultrasonography is concerning for a neural tube defect, since it can further assess the presence of a neural tube defect through detecting the presence of amniotic fluid acetylcholinesterase. The procedure is performed under ultrasound guidance, taking care to avoid the placenta, fetal vessels, and fetus, in addition to the maternal bowel and bladder. Complications of the procedure include premature rupture of membranes, fetal injury, fetal demise, and infection of the mother or fetus. While premature rupture of membranes is common after amniocentesis, the duration of fluid leakage is often limited. In some cases, it can be associated with chronic leakage of fluid, and the mother must undergo routine ultrasonography to monitor amniotic fluid volume. However, even in these instances, the outcome for both the mother and fetus is better than that associated with spontaneous preterm premature rupture of membranes.

Incorrect Answers: A, B, C, and E.

Abruptio placentae (Choice A) presents with vaginal bleeding, severe uterine pain, and tetanic contractions, typically in the third trimester. It commonly results from lower abdominal trauma, smoking, or cocaine use. It is not an adverse effect of amniocentesis.

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is concerning for a neural tube defect, since it can further assess the presence of a neural tube defect through detecting the presence of amniotic fluid acetylcholinesterase. The procedure is performed under ultrasound guidance, taking care to avoid the placenta, fetal vessels, and fetus, in addition to the maternal bowel and bladder. Complications of the procedure include premature rupture of membranes, fetal injury, fetal demise, and infection of the mother or fetus. While premature rupture of membranes is common after amniocentesis, the duration of fluid leakage is often limited. In some cases, it can be associated with chronic leakage of fluid, and the mother must undergo routine ultrasonography to monitor amniotic fluid volume. However, even in these instances, the outcome for both the mother and fetus is better than that associated with spontaneous preterm premature rupture of membranes.

Incorrect Answers: A, B, C, and E.

Abruptio placentae (Choice A) presents with vaginal bleeding, severe uterine pain, and tetanic contractions, typically in the third trimester. It commonly results from lower abdominal trauma, smoking, or cocaine use. It is not an adverse effect of amniocentesis.

Meconium in the amniotic fluid (Choice B) is caused by fetal passage of meconium prior to delivery. This is more common in post-term infants, intrauterine growth restriction, vaginal breech delivery, cesarean delivery, and maternal infection. It can be complicated by aspiration and respiratory distress in the newborn but is not an adverse effect of amniocentesis.

Polyhydramnios (Choice C) is an excess amount of amniotic fluid which is common in multiple gestation pregnancy, maternal diabetes, and fetal malformations such as duodenal or esophageal atresia and anencephaly. It can cause abnormal fetal presentation, cord prolapse with rupture of membranes, and preterm labor. Amniocentesis is more often associated with oligohydramnios or decreased amniotic fluid volume.

Uterine rupture (Choice E) is a dangerous obstetric complication where the uterine wall tears, most commonly during labor and delivery. Acute pain, loss of fetal station, and both maternal and fetal hemodynamic instability are suggestive findings. It is more common in patients who have had a prior cesarean delivery, multiparity, or induction of labor with prostaglandin analogues or oxytocin, but it is not associated with amniocentesis.

Educational Objective: Amniocentesis is a sampling of amniotic fluid obtained through the abdominal wall between 15 to 18 weeks' gestation to evaluate for genetic and structural abnormalities of the fetus. A common complication is premature rupture of membranes, although it is usually self-limited and less associated with fetal morbidity and mortality than spontaneous preterm premature rupture of membranes. Other complications of amniocentesis include fetal injury, fetal or maternal infection, and fetal demise.

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31. A 49-year-old nulligravid woman with type 2 diabetes mellitus comes to the office because of an 18-month history of increasingly heavy irregular menstrual periods. Today, she reports vaginal spotting. Menses occur at 10- to 12-day intervals and last 5 to 7 days; she has to change a regular tampon every 4 to 6 hours. She is 170 cm (5 ft 7 in) tall and weighs 104 kg (230 lb); BMI is 36 kg/m^2. Pelvic examination shows a slightly enlarged uterus without adnexal masses. Which of the following is the most appropriate next step in diagnosis?

A) Complete blood count
B) CT scan of the pelvis
C) Determination of hemoglobin A_{1c}
D) Endometrial biopsy
E) Measurement of serum progesterone concentration

Correct Answer: D.

A normal menstrual cycle lasts approximately 3 to 8 days and occurs every 24 to 38 days. Abnormal uterine bleeding (AUB) is defined as bleeding that is abnormally heavy or frequent (as in this patient), irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). AUB may be caused by structural abnormalities such as cervical or endometrial polyps, adenomyosis, endometrial hyperplasia, endometrial cancer, inflammation or infection of the genital tract, coagulopathy, ovulatory dysfunction, endocrine dysfunction (eg, thyroid disorders, prolactin, androgens), or may be iatrogenic or idiopathic. Risk factors for endometrial cancer (one of the more concerning causes) include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, a history of ovulatory dysfunction, diabetes mellitus, hypertension, obesity, and genetic factors. Many of these risk factors involve estrogen excess, which leads to endometrial proliferation. For example, excess adipose tissue increases aromatase concentrations, which convert circulating androgens to estrogens, and nulliparity leads to an increased exposure to estrogens during menstrual cycles. In all patients with AUB who are older than 45 years or are younger and possess risk factors for endometrial cancer, endometrial biopsy should be performed to evaluate for endometrial cancer (after excluding pregnancy if the patient is premenopausal).

Incorrect Answers: A, B, C, and E.

Complete blood count (Choice A) would be indicated in patients with heavy or prolonged bleeding. This patient's chronic, relatively mild blood loss is unlikely to cause

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heavy or frequent (as in this patient), irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). AUB may be caused by structural abnormalities such as cervical or endometrial polyps, adenomyosis, endometrial hyperplasia, endometrial cancer, inflammation or infection of the genital tract, coagulopathy, ovulatory dysfunction, endocrine dysfunction (eg, thyroid disorders, prolactin, androgens), or may be iatrogenic or idiopathic. Risk factors for endometrial cancer (one of the more concerning causes) include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, a history of ovulatory dysfunction, diabetes mellitus, hypertension, obesity, and genetic factors. Many of these risk factors involve estrogen excess, which leads to endometrial proliferation. For example, excess adipose tissue increases aromatase concentrations, which convert circulating androgens to estrogens, and nulliparity leads to an increased exposure to estrogens during menstrual cycles. In all patients with AUB who are older than 45 years or are younger and possess risk factors for endometrial cancer, endometrial biopsy should be performed to evaluate for endometrial cancer (after excluding pregnancy if the patient is premenopausal).

Incorrect Answers: A, B, C, and E.

Complete blood count (Choice A) would be indicated in patients with heavy or prolonged bleeding. This patient's chronic, relatively mild blood loss is unlikely to cause significant anemia, and endometrial biopsy should be prioritized in this patient with several endometrial cancer risk factors.

CT scan of the pelvis (Choice B) would not be helpful in the initial evaluation of AUB since it does not adequately evaluate the endometrium. Pelvic ultrasonography may be a helpful initial imaging modality to evaluate for structural causes of AUB (eg, adenomyosis, polyps), but an endometrial biopsy is required to properly exclude endometrial cancer and should be performed in patients with endometrial cancer risk factors.

Determination of hemoglobin A_{1c} (Choice C), a marker of a patient's average blood glucose over the past 3 months, would not be helpful in assessing the cause of this patient's AUB.

Serum progesterone (Choice E) is increased at various times during the menstrual cycle, particularly during the luteal phase since it acts to maintain the secretory endometrium. Measuring serum progesterone concentration may assist in determining whether a woman with AUB is ovulating. However, the first priority in this patient older than age 45 years who also possesses several malignancy risk factors is excluding endometrial cancer.

Educational Objective: Risk factors for endometrial cancer include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, diabetes mellitus, obesity, and genetic factors. In all patients with AUB who are older than 45 years or are younger and possess risk factors for endometrial cancer, endometrial biopsy should be performed.

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32. A 27-year-old woman comes to the physician because of a 6-month history of decreased bleeding with menses. She is otherwise asymptomatic. Menses occur at regular 28-day intervals and last for 3 days with light spotting. Her only medication is an oral contraceptive for the past 5 years. Physical examination, including pelvic examination, shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Reassurance
B) Measurement of serum prolactin concentration
C) Progesterone challenge test
D) Pelvic ultrasonography
E) Estrogen supplementation

Correct Answer: A.

A normal menstrual cycle lasts approximately 3 to 8 days and occurs every 24 to 38 days. Light periods do not typically indicate pathology. In patients on oral contraceptive pills, the total duration and volume of a woman's menstrual cycle may decrease over time. This patient should be reassured that the change in the volume of her menstrual periods is typical and that her menstrual cycles fall within normal parameters.

Incorrect Answers: B, C, D, and E.

Measurement of serum prolactin concentration (Choice B) may be indicated in patients with amenorrhea and physical examination signs of hyperprolactinemia such as galactorrhea. This patient does not demonstrate galactorrhea or amenorrhea.

Progesterone challenge test (Choice C) assists in diagnosing the cause of amenorrhea. Patients with sufficient serum estradiol will experience withdrawal bleeding after progesterone is administered, whereas patients with decreased serum estradiol (eg, premature ovarian failure) will not. However, this patient is not experiencing amenorrhea.

Pelvic ultrasonography (Choice D) assists in diagnosing anatomical causes of amenorrhea (eg, cervical outlet obstruction). However, this patient is not experiencing

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B) Measurement of serum prolactin concentration

C) Progesterone challenge test

D) Pelvic ultrasonography

E) Estrogen supplementation

Correct Answer: A.

A normal menstrual cycle lasts approximately 3 to 8 days and occurs every 24 to 38 days. Light periods do not typically indicate pathology. In patients on oral contraceptive pills, the total duration and volume of a woman's menstrual cycle may decrease over time. This patient should be reassured that the change in the volume of her menstrual periods is typical and that her menstrual cycles fall within normal parameters.

Incorrect Answers: B, C, D, and E.

Measurement of serum prolactin concentration (Choice B) may be indicated in patients with amenorrhea and physical examination signs of hyperprolactinemia such as galactorrhea. This patient does not demonstrate galactorrhea or amenorrhea.

Progesterone challenge test (Choice C) assists in diagnosing the cause of amenorrhea. Patients with sufficient serum estradiol will experience withdrawal bleeding after progesterone is administered, whereas patients with decreased serum estradiol (eg, premature ovarian failure) will not. However, this patient is not experiencing amenorrhea.

Pelvic ultrasonography (Choice D) assists in diagnosing anatomical causes of amenorrhea (eg, cervical outlet obstruction). However, this patient is not experiencing amenorrhea.

Estrogen supplementation (Choice E) may be indicated in women with amenorrhea secondary to causes that include low estrogen (eg, premature ovarian failure). However, this patient is not experiencing amenorrhea.

Educational Objective: A wide range of menstrual period durations, frequencies, and volumes are considered normal. Women who take oral contraceptive pills may experience lighter periods over time.

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33. A 27-year-old man comes to the physician for a routine follow-up examination. He has a 22-year history of type 1 diabetes mellitus controlled with daily insulin. He measures his blood glucose concentration once weekly. He has not developed diabetic complications. He does not smoke or drink alcohol. He has an active lifestyle. His pulse is 87/min, and blood pressure is 120/78 mm Hg. Cardiac examination shows no abnormalities. Deep tendon reflexes are brisk and symmetric. His hemoglobin A_{1c} is 6.5%. Which of the following is the most appropriate screening recommendation at this time?

A) Serum lipid studies
B) Liver function tests
C) Electromyography of the lower extremities
D) ECG
E) Ultrasonography of the pancreas

Correct Answer: A.

Adults with type 1 diabetes mellitus are at increased risk for cardiovascular disease such as cardiomyopathy, atherosclerotic changes, and dyslipidemia. Dyslipidemia, or increased serum concentrations of lipids, including low-density cholesterol, are associated with an increased risk for coronary vascular disease. All patients with type 1 diabetes mellitus should be screened for dyslipidemia, with regular annual screening if lipids are abnormal or if their diabetes is poorly controlled. Optimization of serum lipids with pharmacologic treatment and lifestyle modification can decrease the risk for coronary vascular disease and myocardial infarction. This is supported by United States Preventive Services Task Force recommendations.

Incorrect Answers: B, C, D, and E.

Liver function tests (Choice B) would not be indicated in this patient. The patient has neither risk factors for nor symptoms related to liver dysfunction, and a baseline level is not necessary.

Electromyography (Choice C) of the lower extremities can be helpful in the diagnosis and management of diabetic neuropathy. In diabetic patients, chronic hyperglycemia leads to the deposition of advanced glycation end products in capillary endothelium, leading to microvascular damage to capillaries throughout the body, including the vasa

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C) Electromyography of the lower extremities

D) ECG

E) Ultrasonography of the pancreas

Correct Answer: A.

Adults with type 1 diabetes mellitus are at increased risk for cardiovascular disease such as cardiomyopathy, atherosclerotic changes, and dyslipidemia. Dyslipidemia, or increased serum concentrations of lipids, including low-density cholesterol, are associated with an increased risk for coronary vascular disease. All patients with type 1 diabetes mellitus should be screened for dyslipidemia, with regular annual screening if lipids are abnormal or if their diabetes is poorly controlled. Optimization of serum lipids with pharmacologic treatment and lifestyle modification can decrease the risk for coronary vascular disease and myocardial infarction. This is supported by United States Preventive Services Task Force recommendations.

Incorrect Answers: B, C, D, and E.

Liver function tests (Choice B) would not be indicated in this patient. The patient has neither risk factors for nor symptoms related to liver dysfunction, and a baseline level is not necessary.

Electromyography (Choice C) of the lower extremities can be helpful in the diagnosis and management of diabetic neuropathy. In diabetic patients, chronic hyperglycemia leads to the deposition of advanced glycation end products in capillary endothelium, leading to microvascular damage to capillaries throughout the body, including the vasa nervorum in the distal extremities. This patient's diabetes is well-controlled, making the development of diabetic neuropathy unlikely at this time.

ECG (Choice D) is frequently used in the evaluation of syncope, chest pain, and shortness of breath, and it can help with the diagnosis of arrhythmia and myocardial ischemia. A screening ECG is not currently recommended in diabetes without concerning symptoms.

Ultrasonography of the pancreas (Choice E) can be helpful in the evaluation of pancreatitis, pancreatic trauma, pancreatic masses or malignancy, or complications of pancreatitis.

Educational Objective: Type 1 diabetes mellitus patients are at an increased risk for dyslipidemia and should be screened for hyperlipidemia.

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34. A 4-year-old boy is brought to the physician 3 hours after his mother removed a tick from his scalp. She said that he was playing outside this morning. She washes his hair nightly and did not notice the tick last night. He has had no symptoms. He has no history of serious illness. He appears well developed and well nourished and is in no acute distress. Examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Intramuscular ceftriaxone prophylaxis now
B) Measurement of serum Lyme (*Borrelia burgdorferi*) antibody concentration now and again in 2 weeks
C) Oral amoxicillin prophylaxis now
D) Oral doxycycline prophylaxis now
E) Reassurance and follow-up examination in 2 weeks

Correct Answer: E.

Reassurance and follow-up examination in 2 weeks is the most appropriate next step in management of this patient with a recent tick bite. Lyme disease is caused by *Borrelia burgdorferi*, which is transmitted by the bite of the *Ixodes scapularis* tick. Early manifestations of disease include erythema migrans, which is characterized by a circular targetoid lesion that often presents on the extremities. Disseminated disease presents in patients in whom primary infection is overlooked and may present with carditis, heart block, facial nerve palsy, and transient arthritis. Stage three or late disseminated infection presents with chronic arthritis and neurologic complications such as encephalopathy. The tick and organism are common in the northeastern United States but can be seen in other parts of the country as well, and transmission is most common from May through October. Patients should not be tested for Lyme disease if the tick has been attached for less than 24 to 36 hours as the risk for transmission during this time is exceedingly low. Given the short time that this tick was attached, this patient does not warrant testing or treatment/prophylaxis and should be followed clinically instead.

Incorrect Answers: A, B, C, and D.

Intramuscular ceftriaxone prophylaxis now (Choice A) is incorrect. Intravenous ceftriaxone is only indicated for secondary Lyme disease. This patient has a low likelihood of having contracted Lyme disease and does not warrant treatment.

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D) Oral doxycycline prophylaxis now

E) Reassurance and follow-up examination in 2 weeks

Correct Answer: E.

Reassurance and follow-up examination in 2 weeks is the most appropriate next step in management of this patient with a recent tick bite. Lyme disease is caused by *Borrelia burgdorferi*, which is transmitted by the bite of the *Ixodes scapularis* tick. Early manifestations of disease include erythema migrans, which is characterized by a circular targetoid lesion that often presents on the extremities. Disseminated disease presents in patients in whom primary infection is overlooked and may present with carditis, heart block, facial nerve palsy, and transient arthritis. Stage three or late disseminated infection presents with chronic arthritis and neurologic complications such as encephalopathy. The tick and organism are common in the northeastern United States but can be seen in other parts of the country as well, and transmission is most common from May through October. Patients should not be tested for Lyme disease if the tick has been attached for less than 24 to 36 hours as the risk for transmission during this time is exceedingly low. Given the short time that this tick was attached, this patient does not warrant testing or treatment/prophylaxis and should be followed clinically instead.

Incorrect Answers: A, B, C, and D.

Intramuscular ceftriaxone prophylaxis now (Choice A) is incorrect. Intravenous ceftriaxone is only indicated for secondary Lyme disease. This patient has a low likelihood of having contracted Lyme disease and does not warrant treatment.

Measurement of serum Lyme (*Borrelia burgdorferi*) antibody concentration now and again in 2 weeks (Choice B) is not necessary since the tick discovered on this patient has been attached for less than 24 to 36 hours.

Oral amoxicillin prophylaxis now (Choice C) is incorrect. The treatment of choice for early Lyme disease is doxycycline (Choice D), but this patient does not warrant treatment with any antibiotics at this time given his short duration of tick exposure and lack of clinical findings suggesting early disease. Doxycycline is sometimes given as a single dose for prophylaxis in high-risk areas in cases of prolonged attachment.

Educational Objective: Lyme disease is caused by *Borrelia burgdorferi*, which is transmitted by the bite of the *Ixodes scapularis* deer tick. The disease is endemic to the Northeastern United States. Patients with ticks attached for less than 24 to 36 hours do not require laboratory assessment for Lyme disease or antibiotic therapy; instead, they should be observed clinically since the risk for infection is low.

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35. A 67-year-old woman comes to the physician because of a 10-day history of left buttock pain that radiates down her left leg. She describes the pain as shooting and burning. She has a 2-year history of multiple myeloma poorly responsive to chemotherapy. Treatment with oxycodone-acetaminophen (two tablets every 6 hours) has not completely relieved her pain; she rates it as a 5 on a 10-point scale. She lives alone and can perform activities of daily living independently. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 14/min, and blood pressure is 125/85 mm Hg. Examination shows no tenderness to palpation over the lower spine. There is hyperesthesia to light touch over the left thigh. Muscle strength and sensation are intact. Which of the following is the most appropriate pharmacotherapy?

A) Increase oral oxycodone-acetaminophen to four tablets every 6 hours
B) Add oral hydrocodone-acetaminophen every 4 hours to the regimen
C) Add oral meperidine every 6 hours to the regimen
D) Add oral naproxen every 12 hours to the regimen
E) Add oral nortriptyline at bedtime to the regimen

Correct Answer: E.

Nortriptyline, a tricyclic antidepressant (TCA) medication, is the best alternative therapy for this patient with neuropathic pain that is refractory to oxycodone and acetaminophen. Neuropathic pain is commonly described as shooting, burning, or similar to the sensation of electricity or pins and needles. It can be radicular if originating from a spinal nerve impingement and may follow a dermatomal distribution. Neuropathic pain is commonly responsive to tricyclic antidepressants or serotonin-norepinephrine reuptake inhibitors. They are less likely to be effective in the long-term treatment and are also associated with undesirable adverse effects such as the possibility of dependence, respiratory depression, and gastrointestinal motility impairment. Opioids do not generally modulate neuropathic pain though they may provide temporary relief. Additionally, as patients age, opiate analgesics increase the risk for falls and delirium.

Incorrect Answers: A, B, C, and D.

Increasing oral oxycodone-acetaminophen (Choice A), adding hydrocodone-acetaminophen (Choice B), or adding oral meperidine (Choice C), all opioid analgesics, would be less likely to be effective in the long-term treatment of this patient's neuropathy.

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pharmacotherapy?

A) Increase oral oxycodone-acetaminophen to four tablets every 6 hours
B) Add oral hydrocodone-acetaminophen every 4 hours to the regimen
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Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Increasing oral oxycodone-acetaminophen (Choice A), adding hydrocodone-acetaminophen (Choice B), or adding oral meperidine (Choice C), all opioid analgesics, would be less likely to be effective in the long-term treatment of this patient's neuropathy.

Adding oral naproxen every 12 hours to the regimen (Choice D) would not be as effective as nortriptyline in the treatment of neuropathic pain, although it may help provide temporary relief. In addition, naproxen is a nonsteroidal anti-inflammatory drug that can increase the risk for gastric ulcers and renal impairment in elderly patients.

Educational Objective: Nortriptyline, a tricyclic antidepressant medication, is an effective therapy for neuropathic pain. In most cases, it is not appropriate to treat neuropathic pain with opioids.

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36. A 57-year-old man is brought to the emergency department by police 40 minutes after he was found wandering around a train station in a confused state. On arrival, he appears drowsy. His temperature is 37°C (98.6°F), pulse is 72/min, respirations are 14/min, and blood pressure is 135/80 mm Hg. Physical examination shows bilateral nystagmus and a disconjugate lateral gaze. His gait is unsteady and broad based. On mental status examination, he speaks in fragmented sentences and is often incoherent. He can recall zero of three objects after 5 minutes. He is oriented to person but not to place and time. Serum studies show:

Na^+	140 mEq/L
K^+	4 mEq/L
Cl^-	104 mEq/L
HCO_3^-	25 mEq/L
AST	70 U/L
ALT	64 U/L
γ-Glutamyltransferase	55 U/L (N=0–30)

A urine toxicology screening is negative. His blood alcohol concentration is 0 mg/dL. Which of the following is the most appropriate initial step in management?

A) Obtain collateral information
B) CT scan of the head
C) Chlordiazepoxide therapy
D) Donepezil therapy
E) Haloperidol therapy
F) Vitamin B_1 (thiamine) therapy

Correct Answer: F.

Patients who chronically abuse alcohol typically develop a significant vitamin B_1 (thiamine) deficiency because of poor nutritional intake, thiamine malabsorption, and impaired cellular utilization of thiamine. Over time, thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which

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ALT	64 U/L
γ-Glutamyltransferase	55 U/L (N=0–30)

A urine toxicology screening is negative. His blood alcohol concentration is 0 mg/dL. Which of the following is the most appropriate initial step in management?

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C) Chlordiazepoxide therapy
D) Donepezil therapy
E) Haloperidol therapy
F) Vitamin B_1 (thiamine) therapy

Correct Answer: F.

Patients who chronically abuse alcohol typically develop a significant vitamin B_1 (thiamine) deficiency because of poor nutritional intake, thiamine malabsorption, and impaired cellular utilization of thiamine. Over time, thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. Although not currently intoxicated, this patient demonstrates laboratory evidence of chronic alcohol abuse (increased transaminases and γ-glutamyltransferase). The typical clinical presentation of Wernicke encephalopathy is a triad of acute altered mental status (eg, disorientation), ophthalmoplegia/nystagmus, and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome (also known as Korsakoff psychosis) in chronic alcohol users if not immediately treated with high-dose intravenous thiamine therapy. Wernicke-Korsakoff syndrome is an irreversible condition that features anterograde and retrograde amnesia along with the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember.

Incorrect Answers: A, B, C, D, and E.

Obtaining collateral information (Choice A) will be important to determine this patient's social situation, alcohol use history, and baseline neurologic status. However, since he demonstrates classic signs of Wernicke encephalopathy, immediate administration of thiamine should be prioritized.

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impaired cellular utilization of thiamine. Over time, thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. Although not currently intoxicated, this patient demonstrates laboratory evidence of chronic alcohol abuse (increased transaminases and γ-glutamyltransferase). The typical clinical presentation of Wernicke encephalopathy is a triad of acute altered mental status (eg, disorientation), ophthalmoplegia/nystagmus, and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome (also known as Korsakoff psychosis) in chronic alcohol users if not immediately treated with high-dose intravenous thiamine therapy. Wernicke-Korsakoff syndrome is an irreversible condition that features anterograde and retrograde amnesia along with the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember.

Incorrect Answers: A, B, C, D, and E.

Obtaining collateral information (Choice A) will be important to determine this patient's social situation, alcohol use history, and baseline neurologic status. However, since he demonstrates classic signs of Wernicke encephalopathy, immediate administration of thiamine should be prioritized.

CT scan of the head (Choice B) may be appropriate to exclude trauma or malignancy as the cause of cognitive impairment if the patient's neurologic status does not improve with thiamine. However, this patient with the classic signs of Wernicke encephalopathy should be first treated with thiamine.

Chlordiazepoxide therapy (Choice C) is commonly used to treat alcohol withdrawal. However, this patient does not demonstrate tachycardia, tremor, or other signs of alcohol withdrawal.

Donepezil therapy (Choice D) is used to slow the progressive cognitive decline of dementia. This patient's cognitive impairment is likely secondary to the altered mental status of Wernicke encephalopathy and is therefore reversible.

Haloperidol therapy (Choice E) is an antipsychotic medication used to treat psychotic symptoms such as delusions and hallucinations. It is also sometimes used to treat agitation in patients with altered mental status. However, this patient is not agitated.

Educational Objective: Chronic alcohol abuse and associated malnutrition may result in significant thiamine deficiency, which can lead to Wernicke encephalopathy. Wernicke encephalopathy is a triad of acute altered mental status, ophthalmoplegia/nystagmus, and ataxia. Thiamine therapy should be administered immediately to prevent the progression to Wernicke-Korsakoff syndrome, an irreversible dementia syndrome.

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37. A randomized controlled trial is conducted to examine the benefit of using graduated compression stockings for prevention of deep venous thrombosis (DVT) in patients hospitalized for conditions other than cerebral infarction. An additional agent, heparin or low-molecular-weight heparin, is used for prophylaxis in some patients. Results show:

	Group Type	Graduated Compression Stockings	Additional Agent	Rate of DVT (%)
1.	Study	Yes	No	13
2.	Control	No	No	26
3.	Study	Yes	Yes	4
4.	Control	No	Yes	16

Which of the following best represents the relative risk reduction of DVT using graduated compression stockings as a preventive measure compared with no prophylaxis?

A) 13%
B) 25%
C) 50%
D) 75%
E) 217%

Correct Answer: C.

Relative risk (RR) describes the difference in likelihood of the occurrence of a particular disease outcome between two groups of patients with or without a particular exposure. It can be thought of as the proportion of risk from the intervention compared with the risk from the control. Relative risk reduction (RRR) is the proportion of risk reduction that can be attributed to the intervention compared with the control. In order to calculate RRR, the RR must first be known. RR can be calculated with the equation (a / (a + b)) / (c / (c + d)). In this case, the rate of deep venous thrombosis (DVT) in patients using compression stockings is 13% compared with a rate of DVT in

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B) 25%
C) 50%
D) 75%
E) 217%

Correct Answer: C.

Relative risk (RR) describes the difference in likelihood of the occurrence of a particular disease outcome between two groups of patients with or without a particular exposure. It can be thought of as the proportion of risk from the intervention compared with the risk from the control. Relative risk reduction (RRR) is the proportion of risk reduction that can be attributed to the intervention compared with the control. In order to calculate RRR, the RR must first be known. RR can be calculated with the equation (a / (a + b)) / (c / (c + d)). In this case, the rate of deep venous thrombosis (DVT) in patients using compression stockings is 13% compared with a rate of DVT in those not using stockings of 26%. RR is therefore 0.13/0.26 = 0.5. RRR is equal to 1 - RR. In this case, RRR = 1 - 0.5 = 0.5 = 50%.

Incorrect Answers: A, B, D, and E.

13% (Choice A) is the absolute risk reduction (ARR) provided by graduated compression stockings on the incidence of DVT. Whereas relative risk and relative risk reduction convey risk ratios, ARR is the difference between two rates. It can be calculated as ARR = (c / (c + d)) - (a / (a + b)). In this case, ARR = 26% - 13% = 13%.

25% (Choice B) is the RR of graduated compression stockings and an additional agent on DVT incidence. In this case, however, we are seeking the relative risk reduction of DVT from only graduated compression stockings.

75% (Choice D) is the RRR of graduated compression stockings and an additional agent on DVT incidence. For that arm of the study, RR = 0.04/0.16 = 0.25. RRR = 1 - 0.25 = 0.75, or 75%.

217% (Choice E) is incorrect since relative risk reduction is used when an intervention decreases disease occurrence (RR <1). Because RRR = 1 - RR, RRR will thus always be less than 100%.

Educational Objective: RRR is the proportion of risk reduction that can be attributed to the intervention compared with the control. RRR is equal to 1 - RR.

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38. A 68-year-old woman comes to the physician for an examination prior to undergoing total right hip replacement. Preoperative ECG shows a P wave area greater than 4 milliseconds × mV in lead II, findings consistent with enlargement of the left atrium. A recently published study that compares several ECG criteria for left atrial enlargement (LAE) with a reference standard of cardiac CT scanning shows that this criterion has a sensitivity of 73% and a specificity of 19%. Which of the following conclusions is most appropriate based on these data?

A) Based on this criterion, 19% of patients with LAE will be correctly diagnosed with the condition
B) Based on this criterion, 19% of patients without LAE will be incorrectly diagnosed with the condition
C) Based on this criterion, 81% of patients with LAE will be correctly diagnosed with the condition
D) Based on this criterion, 81% of patients without LAE will be incorrectly diagnosed with the condition
E) Of all patients who do not meet this criterion for LAE, 19% will have the condition
F) Of all patients who do not meet this criterion for LAE, 81% will have the condition

Correct Answer: D.

The quality of a diagnostic test is measured by its sensitivity and specificity. Sensitivity is the ability of a test to detect a disease if it is present. Sensitivity may be calculated as 1 - false negative rate. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (Type 2 error). High sensitivity is therefore useful in ruling out a disease. A test is described as specific if it has a high likelihood that when disease is absent, the test is negative, and therefore a low likelihood of a false positive (Type 1 error). Specificity may be calculated as 1 - false positive rate. High specificity is useful in ruling in a disease. In this case, the specificity is 19% and thus the false positive rate is 1 - 0.19 = 0.81 = 81%. In this example, this false positive rate implies that 81% of patients meeting ECG criteria for left atrial enlargement (LAE) will not have changes on cardiac CT, the reference standard for detecting left atrial enlargement. Thus, 81% of patients meeting the ECG criteria will be incorrectly diagnosed with LAE. In other words, only 19% of people without the disease will correctly test negative.

Incorrect Answers: A, B, C, E, and F.

The percentage of patients with LAE who are correctly diagnosed with the condition based on the ECG criterion is dependent on the sensitivity, which is 73% for this test. Thus, 19% (Choice A) and 81% (Choice C) are both incorrect percentages of patients who will be correctly diagnosed with the condition since they do not reflect the actual

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D) Based on this criterion, 81% of patients without LAE will be incorrectly diagnosed with the condition

E) Of all patients who do not meet this criterion for LAE, 19% will have the condition

F) Of all patients who do not meet this criterion for LAE, 81% will have the condition

Correct Answer: D.

The quality of a diagnostic test is measured by its sensitivity and specificity. Sensitivity is the ability of a test to detect a disease if it is present. Sensitivity may be calculated as 1 - false negative rate. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (Type 2 error). High sensitivity is therefore useful in ruling out a disease. A test is described as specific if it has a high likelihood that when disease is absent, the test is negative, and therefore a low likelihood of a false positive (Type 1 error). Specificity may be calculated as 1 - false positive rate. High specificity is useful in ruling in a disease. In this case, the specificity is 19% and thus the false positive rate is 1 - 0.19 = 0.81 = 81%. In this example, this false positive rate implies that 81% of patients meeting ECG criteria for left atrial enlargement (LAE) will not have changes on cardiac CT, the reference standard for detecting left atrial enlargement. Thus, 81% of patients meeting the ECG criteria will be incorrectly diagnosed with LAE. In other words, only 19% of people without the disease will correctly test negative.

Incorrect Answers: A, B, C, E, and F.

The percentage of patients with LAE who are correctly diagnosed with the condition based on the ECG criterion is dependent on the sensitivity, which is 73% for this test. Thus, 19% (Choice A) and 81% (Choice C) are both incorrect percentages of patients who will be correctly diagnosed with the condition since they do not reflect the actual sensitivity of the test.

Based on the ECG criterion, 81%, not 19% (Choice B), of patients without LAE will be incorrectly diagnosed with the condition. The percentage of patients without LAE who will be incorrectly diagnosed with the condition is equal to the false negative rate, or 1 - specificity. This is calculated in this example as 1 - 0.19 = 0.81 = 81%.

The false negative rate, or the percentage of patients who do not meet ECG criterion for LAE but have the condition, is equal to 1 - sensitivity. In this case, 1- sensitivity = 1 - 0.73 = 0.27 = 27%. Thus, 27% of patients who do not meet this criterion for LAE, not 19% (Choice E) or 81% (Choice F), will have the condition.

Educational Objective: Sensitivity is the ability of a test to detect a disease if it is present. Sensitivity may be calculated as 1 - false negative rate. Specificity is the probability that a test will demonstrate a negative result when disease is absent. Specificity may be calculated as 1 - false positive rate.

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39. A study is conducted to evaluate the effects of smoking on birth weight at term. Four cohorts of 10 pregnant patients each are identified on the basis of cigarette use. In cohort 1, patients smoke less than one pack of cigarettes daily; in cohort 2, patients smoke one to less than two packs of cigarettes daily; and in cohort 3, patients smoke two or more packs of cigarettes daily during pregnancy. The control group consists of patients who have never smoked cigarettes. Results of the study show the following birth weights:

	Cohort 1	Cohort 2	Cohort 3	Control Group
Mean	3155 g (6 lb 15 oz)	3028 g (6 lb 11 oz)	3015 g (6 lb 10 oz)	3310 g (7 lb 5 oz)
Standard Deviation	± 350	± 390	± 485	± 270

Which of the following is the most accurate interpretation of these results?

A) Smoking does not influence birth weight at term
B) The study is inconclusive because a type II error is likely
C) There is a significant difference between cohort 1 and the control group
D) There is a significant difference between cohort 2 and the control group
E) There is a significant difference between cohort 3 and the control group

Correct Answer: B.

The most accurate interpretation of these results is that the study is inconclusive because a Type 2 error is likely. When conducting any experiment, two hypotheses are created. The null hypothesis, or H_0, states that there is no difference between the groups being compared. The alternative hypothesis, or H_1, suggests that there is a difference between the groups being compared. A Type 2 error occurs when a study demonstrates no difference between the null and alternative hypotheses when, in fact, a difference exists. It is known as a “false-negative” error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements. In this example, the birth weights of cohorts 1, 2, and 3 differ in their means but have significant overlap in their standard deviations. However, the sample size of each cohort is only 10 patients. The power of a study to detect a difference between groups is inverse to sample size; this study is likely underpowered to detect a difference between the cohorts and control group. Thus, the rate of a Type 2 error, which is calculated by subtracting the power from 100%, is high. The study should be repeated with greatly increased numbers of patients in each cohort to be sufficiently powered to detect differences between the groups

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B) The study is inconclusive because a type II error is likely

C) There is a significant difference between cohort 1 and the control group

D) There is a significant difference between cohort 2 and the control group

E) There is a significant difference between cohort 3 and the control group

Correct Answer: B.

The most accurate interpretation of these results is that the study is inconclusive because a Type 2 error is likely. When conducting any experiment, two hypotheses are created. The null hypothesis, or H_0, states that there is no difference between the groups being compared. The alternative hypothesis, or H_1, suggests that there is a difference between the groups being compared. A Type 2 error occurs when a study demonstrates no difference between the null and alternative hypotheses when, in fact, a difference exists. It is known as a "false-negative" error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements. In this example, the birth weights of cohorts 1, 2, and 3 differ in their means but have significant overlap in their standard deviations. However, the sample size of each cohort is only 10 patients. The power of a study to detect a difference between groups is inverse to sample size; this study is likely underpowered to detect a difference between the cohorts and control group. Thus, the rate of a Type 2 error, which is calculated by subtracting the power from 100%, is high. The study should be repeated with greatly increased numbers of patients in each cohort to be sufficiently powered to detect differences between the groups.

Incorrect Answers: A, C, D, and E.

Based on this study, it cannot be definitively stated that smoking does not influence birth weight at term (Choice A) since there is a high likelihood that a Type 2 error, or false-negative error, has occurred.

There is no significant difference between either cohort 1 (Choice C), cohort 2 (Choice D), or cohort 3 (Choice E) and the control group. When taking into account the standard deviation, the mean birth weight in the control group is equal to 3310 g ± 270 (or 3040 to 3580). The mean birth weight in cohort 1 is 3155 g ± 350 (2805 to 3505). The mean birth weight in cohort 2 is 3028 g ± 390 (2638 to 3418). The mean birth weight in cohort 3 is 3015 g ± 485 (2530 to 3500). There is significant overlap between each of these groups; thus, this particular study did not find a significant difference in the mean birth weight in children born to smokers or nonsmokers.

Educational Objective: A Type 2 error occurs when a study demonstrates no difference between the null and alternative hypotheses when, in fact, a difference exists. It is known as a false-negative error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements.

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40. A 21-year-old college student comes to the physician for a follow-up examination. Seven days ago, a biopsy specimen of a cervical lymph node showed Hodgkin disease, and 2 days ago, an abdominal CT scan showed enlarged para-aortic lymph nodes. Examination today shows no abnormalities except for cervical adenopathy. He asks the physician, "What are my chances?" The physician recalls a recent well-designed study that showed 80% of patients with stage III Hodgkin disease survive more than 5 years. Which of the following is the most appropriate physician response?

A) "Hodgkin disease is a serious condition."
B) "I'm not sure. I will have to get back to you with an answer."
C) "It is hard to give you a reliable number. Try to take one day at a time."
D) "Tell me more about what you want to know."
E) "Twenty percent of patients like you only survive 5 years."

Correct Answer: D.

This patient has asked a vague question about his prognosis. The physician should first attempt to clarify his preferences for delivery of the news. Before delivering bad news, physicians should inquire about how much and what type of information a patient desires to hear. Information about a bad prognosis commonly changes a patient's life, and some patients may prefer not to know all of the details of their prognosis. This patient-centered approach honors patient autonomy.

Incorrect Answers: A, B, C, and E.

Stating that Hodgkin disease is a serious condition (Choice A) may be appropriate after clarifying what information the patient prefers to receive.

Implying that there is uncertainty about the prognosis of patients with this patient's diagnosis (Choices B and C) is inaccurate and dishonest given the physician's knowledge of the study. These responses do not honor the patient's request for more information, instead representing a paternalistic approach that assumes that the patient will not be able to handle the truth.

It may be appropriate to share the twenty percent statistic from the study (Choice E) if the patient desires this information. However, beginning the discussion with this

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A) "Hodgkin disease is a serious condition."
B) "I'm not sure. I will have to get back to you with an answer."
C) "It is hard to give you a reliable number. Try to take one day at a time."
D) "Tell me more about what you want to know."
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Correct Answer: D.

This patient has asked a vague question about his prognosis. The physician should first attempt to clarify his preferences for delivery of the news. Before delivering bad news, physicians should inquire about how much and what type of information a patient desires to hear. Information about a bad prognosis commonly changes a patient's life, and some patients may prefer not to know all of the details of their prognosis. This patient-centered approach honors patient autonomy.

Incorrect Answers: A, B, C, and E.

Stating that Hodgkin disease is a serious condition (Choice A) may be appropriate after clarifying what information the patient prefers to receive.

Implying that there is uncertainty about the prognosis of patients with this patient's diagnosis (Choices B and C) is inaccurate and dishonest given the physician's knowledge of the study. These responses do not honor the patient's request for more information, instead representing a paternalistic approach that assumes that the patient will not be able to handle the truth.

It may be appropriate to share the twenty percent statistic from the study (Choice E) if the patient desires this information. However, beginning the discussion with this shocking statistic may overwhelm the patient and constitute more information than he desires. The physician should first clarify the patient's preferences for information delivery.

Educational Objective: Before delivering bad news, physicians should clarify a patient's preferences for delivery of this information. This patient-centered approach honors patient autonomy.

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41. A 27-year-old man is brought to the emergency department by friends because of fever and chills since beginning treatment with penicillin and azithromycin 4 hours ago for a sexually transmitted disease. He has no history of serious illness and has no known allergies. On arrival, he appears ill. His temperature is 39.4°C (103°F), pulse is 120/min, and blood pressure is 90/52 mm Hg. Examination shows rigors. Which of the following is the most likely explanation for this patient's current symptoms?

A) Acute bacterial sepsis
B) Acute HIV infection
C) Adverse effect of azithromycin
D) Adverse effect of penicillin
E) Inadequate treatment of the infection
F) Jarisch-Herxheimer reaction

Correct Answer: F.

Treponema pallidum is the spirochete that causes syphilis, a sexually transmitted infection that has various presentations depending on the stage of infection. Primary syphilis presents with a painless genital chancre, which is a shallow ulcer with a clean base. If this goes untreated, secondary syphilis can develop. Secondary infection is characterized by a scaly rash, classically involving the palms and soles, along with condyloma lata. Condyloma lata are typically whitish-gray, flat-topped lesions. Tertiary syphilis, the most advanced form, has symptoms of neurosyphilis (eg, tabes dorsalis, Argyll Robertson pupil, ataxia) and aortitis. Diagnosis is typically made with serologic testing, and penicillin is the treatment of choice. The Jarisch-Herxheimer reaction can occur after treatment with penicillin and is thought to be caused by the release of proinflammatory antigens and cytokines from the lysed spirochetes. It presents with fever and nonspecific symptoms, such as myalgias and headache. Vital signs may demonstrate tachycardia and hypotension, whereas physical examination can show rigors and worsening of the rash of secondary syphilis. Treatment is supportive, with most cases improving within 12 to 24 hours.

Incorrect Answers: A, B, C, D, and E.

Acute bacterial sepsis (Choice A) often presents with fever, tachycardia, tachypnea, hypotension, and leukocytosis in the setting of active infection. It is more common in

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Treponema pallidum is the spirochete that causes syphilis, a sexually transmitted infection that has various presentations depending on the stage of infection. Primary syphilis presents with a painless genital chancre, which is a shallow ulcer with a clean base. If this goes untreated, secondary syphilis can develop. Secondary infection is characterized by a scaly rash, classically involving the palms and soles, along with condyloma lata. Condyloma lata are typically whitish-gray, flat-topped lesions. Tertiary syphilis, the most advanced form, has symptoms of neurosyphilis (eg, tabes dorsalis, Argyll Robertson pupil, ataxia) and aortitis. Diagnosis is typically made with serologic testing, and penicillin is the treatment of choice. The Jarisch-Herxheimer reaction can occur after treatment with penicillin and is thought to be caused by the release of proinflammatory antigens and cytokines from the lysed spirochetes. It presents with fever and nonspecific symptoms, such as myalgias and headache. Vital signs may demonstrate tachycardia and hypotension, whereas physical examination can show rigors and worsening of the rash of secondary syphilis. Treatment is supportive, with most cases improving within 12 to 24 hours.

Incorrect Answers: A, B, C, D, and E.

Acute bacterial sepsis (Choice A) often presents with fever, tachycardia, tachypnea, hypotension, and leukocytosis in the setting of active infection. It is more common in elderly patients, immunocompromised patients, and in patients with indwelling devices such as central venous catheters. While sexually transmitted infections can rarely cause acute bacterial sepsis, this patient is currently receiving antibiotics, which makes this less likely.

Acute HIV infection (Choice B) may be asymptomatic or present nonspecifically with fever, headache, sore throat, myalgias, diarrhea, lymphadenopathy, and rash. It is less likely to present with tachycardia, hypotension, and rigors. Additionally, this patient just received penicillin for syphilis, making the Jarisch-Herxheimer reaction more likely.

An adverse effect of azithromycin (Choice C) or an adverse effect of penicillin (Choice D) is unlikely to be the cause of this patient's presentation. Antibiotics can cause mild reactions, such as rash, nausea, and vomiting, or severe, anaphylactic reactions with hives, bronchospasm, angioedema, and cardiovascular collapse. This patient has no allergies, and a fever, rigors, tachycardia, and hypotension are unlikely to be results of an adverse effect of an antibiotic.

Inadequate treatment of the infection (Choice E) would present with worsening symptoms of infection or a failure of titers to decrease following treatment. Failure of treatment has not been reported with penicillin and would not present with fever, rigors, tachycardia, and hypotension.

Educational Objective: Jarisch-Herxheimer reaction can occur following the treatment of syphilis with penicillin. It presents with fever, myalgias, headache, tachycardia, and hypotension. Treatment is supportive.

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42. A 27-year-old man comes to the physician because of a 3-month history of episodes of palpitations, light-headedness, and tightness in his chest and throat. During the episodes, he feels an impending sense of doom and fears that he might die or "go crazy." For the past 6 weeks, he has worried constantly that there is something wrong with his heart and that the symptoms will recur. He recently ended a 3-year relationship. He is a high school teacher. Physical examination shows no abnormalities. Mental status examination shows an anxious affect. Which of the following is the most likely diagnosis?

A) Adjustment disorder with anxiety
B) Generalized anxiety disorder
C) Illness anxiety disorder
D) Panic disorder
E) Somatization disorder

Correct Answer: D.

Panic disorder features panic attacks that occur unexpectedly and are associated with worry about future panic attacks or changes in behavior to avoid panic attack triggers. This patient is likely experiencing recurrent panic attacks consistent with panic disorder. Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with four additional physical symptoms or associated mental states. These additional symptoms may include heart palpitations or tachycardia, shortness of breath, chest pain, dizziness, the sensation of choking, gastrointestinal distress, paresthesia, sweating, chills, trembling, derealization, the fear of dying, and/or the fear of losing control. Treatment typically includes psychotherapy, long-term selective serotonin reuptake inhibitors, and potential short-term benzodiazepines.

Incorrect Answers: A, B, C, and E.

Adjustment disorder (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor and may be associated with anxiety, depression, and/or conduct disturbances. By definition, patients with adjustment disorder do not meet the criteria for other anxiety or depressive disorders, whereas this patient meets panic disorder criteria.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features persistent and excessive worrying about a range of topics with associated functional

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Panic disorder features panic attacks that occur unexpectedly and are associated with worry about future panic attacks or changes in behavior to avoid panic attack triggers. This patient is likely experiencing recurrent panic attacks consistent with panic disorder. Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with four additional physical symptoms or associated mental states. These additional symptoms may include heart palpitations or tachycardia, shortness of breath, chest pain, dizziness, the sensation of choking, gastrointestinal distress, paresthesia, sweating, chills, trembling, derealization, the fear of dying, and/or the fear of losing control. Treatment typically includes psychotherapy, long-term selective serotonin reuptake inhibitors, and potential short-term benzodiazepines.

Incorrect Answers: A, B, C, and E.

Adjustment disorder (Choice A) refers to the onset of disproportionate distress within 3 months of an identifiable stressor and may be associated with anxiety, depression, and/or conduct disturbances. By definition, patients with adjustment disorder do not meet the criteria for other anxiety or depressive disorders, whereas this patient meets panic disorder criteria.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features persistent and excessive worrying about a range of topics with associated functional impairment. This patient does not demonstrate a wide range of worries, as he worries about panic attack recurrences specifically.

Patients with illness anxiety disorder (Choice C), formerly known as hypochondriasis, demonstrate persistently excessive anxiety and preoccupation about the possibility that they may have or acquire a serious illness such that they perform frequent health-related behaviors or exhibit maladaptive avoidance. This patient's worry about having a heart condition occurred after the onset of his panic attacks and is likely secondary to his fear of future panic attacks. As well, this patient does not demonstrate evidence of excessive or avoidance of health care-seeking behavior.

In somatization disorder (Choice E), or somatic symptom disorder, the patient is excessively preoccupied with one or more somatic symptoms such that these symptoms disrupt the patient's daily life. Patients persistently devote excessive time and energy to these symptoms or related health concerns (eg, repeatedly going to the doctor). This patient does not demonstrate evidence of excessive health care-seeking behavior and isn't preoccupied with ongoing somatic symptoms (his frightening somatic symptoms occur during panic attacks only).

Educational Objective: Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with symptoms of sympathetic hyperactivity such as tachycardia, heart palpitations, sweating, and trembling along with shortness of breath, chest pain, dizziness, gastrointestinal distress, and paresthesia. Panic disorder is characterized by recurrent panic attacks that are unexpected and associated with worry about future panic attacks or avoidance of panic attack triggers.

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43. A 32-year-old woman comes to the physician because of a 4-day history of fever. She has had swelling and redness of her left leg during this period. She has a history of chronic lymphedema in both legs. She is 165 cm (5 ft 5 in) tall and weighs 107 kg (235 lb); BMI is 39 kg/m^2. Her temperature is 38.5°C (101.3°F). The left lower extremity is diffusely red and edematous from just below the knee to the ankle, with a sharp demarcation separating the erythematous area from the normal skin at the knee. The erythematous area is painful and hyperesthetic to touch. The left femoral nodes are enlarged and painful. Which of the following is the most likely cause of this patient's illness?

A) Deep venous thrombosis
B) *Escherichia coli* infection
C) Group A streptococcus infection
D) Necrotizing fasciitis
E) Superficial thrombophlebitis

Correct Answer: C.

Group A streptococcus cellulitis of the left leg is the most likely cause of this patient's illness. Cellulitis presents with cutaneous erythema, warmth, and induration, often following inoculation from an injury such as an abrasion. Patients with chronic lymphedema are at an increased risk for developing cellulitis. Systemic symptoms, including fever, tachycardia, and leukocytosis are often present. Most commonly, it is acute and results from a bacterial infection of the skin. The two most common pathogens to cause cellulitis are *Staphylococcus aureus* and *Streptococcus pyogenes* (group A). Clinically, the cellulitis caused by *S. aureus* is typically purulent while that caused by *S. pyogenes* is not. Thus, in this case without purulence, a group A streptococcus infection is more likely. In addition to cellulitis, infection with *S. pyogenes* can result in various diseases such as pharyngitis, scarlet fever, necrotizing fasciitis, glomerulonephritis, and rheumatic fever.

Incorrect Answers: A, B, D, and E.

Deep venous thrombosis (Choice A) is the presence of a blood clot within a deep vein of the upper or lower extremity while superficial thrombophlebitis (Choice E) involves a superficial vein. Commonly seen clinical features of both include unilateral edema, warmth, and erythema with pain along the course of an involved vein. A palpable cord may be present. Fever, diffuse swelling and redness, pain, hyperesthesia, and inguinal lymphadenopathy favor a diagnosis of cellulitis.

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E) Superficial thrombophlebitis

Correct Answer: C.

Group A streptococcus cellulitis of the left leg is the most likely cause of this patient's illness. Cellulitis presents with cutaneous erythema, warmth, and induration, often following inoculation from an injury such as an abrasion. Patients with chronic lymphedema are at an increased risk for developing cellulitis. Systemic symptoms, including fever, tachycardia, and leukocytosis are often present. Most commonly, it is acute and results from a bacterial infection of the skin. The two most common pathogens to cause cellulitis are *Staphylococcus aureus* and *Streptococcus pyogenes* (group A). Clinically, the cellulitis caused by *S. aureus* is typically purulent while that caused by *S. pyogenes* is not. Thus, in this case without purulence, a group A streptococcus infection is more likely. In addition to cellulitis, infection with *S. pyogenes* can result in various diseases such as pharyngitis, scarlet fever, necrotizing fasciitis, glomerulonephritis, and rheumatic fever.

Incorrect Answers: A, B, D, and E.

Deep venous thrombosis (Choice A) is the presence of a blood clot within a deep vein of the upper or lower extremity while superficial thrombophlebitis (Choice E) involves a superficial vein. Commonly seen clinical features of both include unilateral edema, warmth, and erythema with pain along the course of an involved vein. A palpable cord may be present. Fever, diffuse swelling and redness, pain, hyperesthesia, and inguinal lymphadenopathy favor a diagnosis of cellulitis.

Escherichia coli infection (Choice B) is uncommon in the skin. Occasionally, lower extremity wounds may become infected with *Escherichia coli* because of contamination with fecal material, but this would not likely cause a spontaneous infection as this patient demonstrates. *Staphylococcus aureus* and group A *Streptococcus* are much more common causes of cellulitis.

Necrotizing fasciitis (Choice D) is another soft-tissue infection that may be caused by group A streptococcus infection. However, cellulitis affects the dermis while necrotizing fasciitis involves the fascia and subcutaneous adipose tissue. Necrotizing fasciitis progresses rapidly and would be expected to present with severe symptoms and signs after 4 days such as high fevers, necrosis, mottling, bullae, and crepitus of involved skin. Furthermore, features of necrotizing fasciitis such as pain out of proportion to examination are absent.

Educational Objective: Cellulitis presents with cutaneous erythema, warmth, and induration, often following inoculation from an injury such as an abrasion. Systemic symptoms, including fever, tachycardia, and leukocytosis are often present. The two most common pathogens to cause cellulitis are *Staphylococcus aureus* and *Streptococcus pyogenes* (group A).

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44. A 3-month-old girl has had increased blood pressure measurements since admission to the hospital for pneumonia and bronchiolitis 2 days ago. She was born at 26 weeks' gestation because of premature labor and weighed 750 g (1 lb 10 oz) at birth. During the first 2 days of life, an umbilical artery catheter was used to monitor her blood pressure. She had several episodes of hypotension that resolved after administration of fluid boluses. She remained in the neonatal intensive care unit for management of respiratory distress and poor weight gain until the age of 10 weeks, when her vital signs had stabilized and condition had improved. At that time, she was discharged home on 0.5 L/min of oxygen. Her current medications are a multivitamin with iron and budesonide. She appears well developed and well nourished but is in respiratory distress. She weighs 3005 g (6 lb 10 oz). Her temperature is 37°C (98.6°F), pulse is 160/min, respirations are 70/min, and blood pressure is 128/86 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. On pulmonary examination, crackles over the left lung base and scattered bilateral expiratory wheezes are heard. On cardiac examination, a grade 1/6, systolic ejection murmur is heard best at the upper left sternal border. The abdomen is soft and nontender. Femoral pulses are 2+ bilaterally. Serum studies are most likely to show which of the following sets of findings?

	Renin	Aldosterone
A)	Decreased	decreased
B)	Decreased	increased
C)	Increased	decreased
D)	Increased	increased
E)	Normal	normal

Correct Answer: D.

Renal artery thrombosis is a rare complication of umbilical artery catheterization that can present up to several weeks after the catheter has been removed. Occlusion of the renal artery by the thrombus results in decreased afferent blood flow to the affected kidney and increased renin production from the juxtaglomerular apparatus. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme (ACE) in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension and stimulates aldosterone release by the adrenal cortex. The overstimulation of the renin-angiotensin-aldosterone system results in secondary hypertension. Treatment of renal artery thrombosis includes systemic anticoagulation and volume resuscitation. Unilateral nephrectomy may be required in the setting of refractory hypertension.

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		Increased	Increased
E)	Normal	normal	

Correct Answer: D.

Renal artery thrombosis is a rare complication of umbilical artery catheterization that can present up to several weeks after the catheter has been removed. Occlusion of the renal artery by the thrombus results in decreased afferent blood flow to the affected kidney and increased renin production from the juxtaglomerular apparatus. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme (ACE) in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension and stimulates aldosterone release by the adrenal cortex. The overstimulation of the renin-angiotensin-aldosterone system results in secondary hypertension. Treatment of renal artery thrombosis includes systemic anticoagulation and volume resuscitation. Unilateral nephrectomy may be required in the setting of refractory hypertension.

Incorrect Answers: A, B, C, and E.

Choice A with decreased renin and decreased aldosterone concentrations is typically seen in patients with Liddle syndrome, a rare congenital disorder associated with defects in collecting tubule sodium channels. Patients typically present in childhood with hypertension, hypokalemia, and metabolic alkalosis.

Choice B with decreased renin and increased aldosterone concentrations is consistent with Conn syndrome, or primary aldosteronism. It classically presents with hypertension and hypokalemia. It may be caused by congenital disorders, adrenal hyperplasia, or aldosterone-producing masses.

Choice C with increased renin and decreased aldosterone concentrations is seen in adrenal insufficiency. Adrenal insufficiency typically presents with vague symptoms including fatigue, nausea, weakness, hypotension, and hyponatremia. Severe cases can result in adrenal crisis with hemodynamic instability.

Choice E with normal concentrations of renin and aldosterone would not be expected in this patient with a major risk factor for renal artery thrombosis and new, persistent hypertension.

Educational Objective: Impaired perfusion to one or both kidneys is a potential cause of secondary hypertension. Renal artery thrombosis is a rare disorder associated with umbilical artery catheterization. Occlusion of the renal artery by the thrombus results in decreased afferent blood flow to the affected kidney and increased renin production from the juxtaglomerular apparatus.

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45. A 16-month-old girl is brought to the emergency department after the sudden onset of difficulty breathing and cough at a birthday party. She has not had fever, vomiting, diarrhea, runny nose, congestion, or a decrease in appetite or activity level. Immunizations are up-to-date. There are no known sick contacts, and there is no family history of serious illness. She appears healthy but is in moderate respiratory distress. She is at the 50th percentile for length and weight. Her respirations are 40/min; other vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 96%. Pulmonary examination shows minimal subcostal retractions; no wheezes or crackles are heard. Breath sounds are mildly decreased over the right upper lung fields. The remainder of the examination shows no abnormalities. An AP chest x-ray shows normal findings. Which of the following is the most appropriate next step in management?

A) Bronchoscopy
B) Oral amoxicillin therapy
C) Oral methylprednisolone therapy
D) Ventilation-perfusion lung scans
E) Observation for 48 hours

Correct Answer: A.

Acute onset of difficulty breathing and cough raises suspicion for foreign body aspiration. Foreign body aspiration can cause obstruction of the airway, leading to impaired oxygenation and ventilation. Children from 1 to 3 years old are at increased risk for foreign body aspiration because of ability to stand and mobilize independently, ability to grasp and put small objects into their mouths, and an immature swallowing mechanism. Foreign bodies can be located anywhere in the airway between the larynx and the bronchi. Children can present with severe respiratory distress, cyanosis, and stridor, or they may have a less severe presentation with partial airway obstruction, presenting with cough, tachypnea, decreased air entry on auscultation, or wheezing. Chest x-ray can show hyperinflation of one lung, which is caused by air trapping and partial airway obstruction in which air is able to pass via inspiration but not exhalation. Foreign bodies are typically in the right lung because of the more vertical anatomic position of the right main bronchus. Management of foreign body aspiration involves flexible or rigid bronchoscopy to remove the object. Object removal is necessary and retained foreign bodies can be complicated by airway inflammation and infection.

Incorrect Answers: B, C, D, and E.

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Acute onset of difficulty breathing and cough raises suspicion for foreign body aspiration. Foreign body aspiration can cause obstruction of the airway, leading to impaired oxygenation and ventilation. Children from 1 to 3 years old are at increased risk for foreign body aspiration because of ability to stand and mobilize independently, ability to grasp and put small objects into their mouths, and an immature swallowing mechanism. Foreign bodies can be located anywhere in the airway between the larynx and the bronchi. Children can present with severe respiratory distress, cyanosis, and stridor, or they may have a less severe presentation with partial airway obstruction, presenting with cough, tachypnea, decreased air entry on auscultation, or wheezing. Chest x-ray can show hyperinflation of one lung, which is caused by air trapping and partial airway obstruction in which air is able to pass via inspiration but not exhalation. Foreign bodies are typically in the right lung because of the more vertical anatomic position of the right main bronchus. Management of foreign body aspiration involves flexible or rigid bronchoscopy to remove the object. Object removal is necessary and retained foreign bodies can be complicated by airway inflammation and infection.

Incorrect Answers: B, C, D, and E.

Oral amoxicillin therapy (Choice B) would be indicated if the patient presented with a bacterial illness, such as pneumonia, streptococcal pharyngitis, or acute otitis media. Patients with pneumonia can present with cough; however, it is typically a subacute onset, and a chest x-ray would show localized infiltrate or opacification in an area of the lung.

Oral methylprednisolone therapy (Choice C) would be helpful in a patient with moderate to severe acute asthma exacerbation along with nebulized albuterol. Corticosteroids decrease inflammation of airways and have been shown to decrease hospitalizations for asthma. This patient does not have a history of asthma or wheezing on examination, making acute asthma exacerbation less likely.

Ventilation-perfusion lung scans (Choice D) can be used in the diagnosis of pulmonary embolism, which can present with acute onset dyspnea and pleuritic chest pain, tachycardia, tachypnea, and hypoxia. Pulmonary embolism is unlikely in a pediatric patient, and foreign body aspiration is much more likely in this case.

Observation for 48 hours (Choice E) may be appropriate following removal of the foreign body if there is concern for airway swelling leading to obstruction, but it would follow bronchoscopy, not occur in place of it.

Educational Objective: Children with foreign body aspiration can present with severe respiratory distress, cyanosis, and stridor, or they may have a less severe presentation with partial airway obstruction, presenting with cough, tachypnea, decreased air entry on auscultation, or wheezing. Management of foreign body aspiration involves flexible or rigid bronchoscopy to remove the object.

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46. A 27-year-old nulligravid woman comes to the physician because of a 3-month history of intermittent abdominal cramps and diarrhea. She has not had blood or mucus in her stool. She reports that the symptoms usually occur after eating, are exacerbated by caffeine and stress, and are relieved by bowel movements. Changing her diet and avoiding dairy products have not improved her symptoms. She has two to three bowel movements daily. Examination shows mild generalized tenderness and increased bowel sounds. Which of the following is the most appropriate initial pharmacotherapy?

A) Ibuprofen
B) Lactulose
C) Loperamide
D) Mesalamine
E) Prednisone

Correct Answer: C.

Irritable bowel syndrome (IBS) is characterized by recurrent, intermittent abdominal pain and alteration of bowel habits as either a change in stool frequency or consistency. The abdominal pain may be either exacerbated or relieved by defecation and can vary widely in location and character. IBS commonly presents with intermittent episodes of diarrhea and/or constipation, which often alternate. When diarrhea does occur, it usually does so during waking hours which serves to differentiate it from other causes of diarrhea. It is most common in middle-aged women and the pathogenesis is unknown. It is not caused by a structural abnormality, and physical examination will show nonspecific abdominal discomfort rather than localized pain. Stress management may improve bowel habits in patients with irritable bowel syndrome, which is often associated with concomitant anxiety. Pharmacologic treatment can improve symptoms. Loperamide is used as an antidiarrheal agent. Additional medications include dicyclomine, an antispasmodic agent, and diphenoxylate, which slows gut motility.

Incorrect Answers: A, B, D, and E.

Ibuprofen (Choice A) is sometimes used to relieve aching and pain associated with IBS, but some patients may experience worsened gastric discomfort secondary to use. Acetaminophen is generally recommended instead.

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C) Loperamide
D) Mesalamine
E) Prednisone

Correct Answer: C.

Irritable bowel syndrome (IBS) is characterized by recurrent, intermittent abdominal pain and alteration of bowel habits as either a change in stool frequency or consistency. The abdominal pain may be either exacerbated or relieved by defecation and can vary widely in location and character. IBS commonly presents with intermittent episodes of diarrhea and/or constipation, which often alternate. When diarrhea does occur, it usually does so during waking hours which serves to differentiate it from other causes of diarrhea. It is most common in middle-aged women and the pathogenesis is unknown. It is not caused by a structural abnormality, and physical examination will show nonspecific abdominal discomfort rather than localized pain. Stress management may improve bowel habits in patients with irritable bowel syndrome, which is often associated with concomitant anxiety. Pharmacologic treatment can improve symptoms. Loperamide is used as an antidiarrheal agent. Additional medications include dicyclomine, an antispasmodic agent, and diphenoxylate, which slows gut motility.

Incorrect Answers: A, B, D, and E.

Ibuprofen (Choice A) is sometimes used to relieve aching and pain associated with IBS, but some patients may experience worsened gastric discomfort secondary to use. Acetaminophen is generally recommended instead.

Lactulose (Choice B) and other laxatives should be avoided in patients with irritable bowel syndrome that primarily manifests with diarrhea instead of constipation. Laxatives are often used in constipation-predominant IBS but can contribute to worsened abdominal bloating and distension.

Mesalamine (Choice D) has an established benefit in treatment of inflammatory bowel disease (IBD), with localized anti-inflammatory effects in the colon that decrease symptoms of Crohn disease and ulcerative colitis. It does not have an established role in treatment of IBS. Similarly, prednisone (Choice E) is used for treatment and maintenance therapy of IBD but has not been shown to be effective in treating IBS.

Educational Objective: IBS is characterized by recurrent, intermittent abdominal pain and alteration of bowel habits as either a change in stool frequency or consistency. The condition is chronic and, in most patients, the severity of symptoms varies over time.

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47. A 24-year-old woman, gravida 2, para 2, comes to the physician requesting advice regarding contraception. She states that she does not want to have any more children, but neither she nor her husband wishes to undergo a permanent sterilization procedure at this time. She requests a contraceptive method that has the lowest failure rate for the first year of use. Her second child was born 6 weeks ago at term after an uncomplicated pregnancy and delivery. Her infant is exclusively breast-fed. The patient has no history of serious illness and takes no medications. She has not had sexual intercourse for 2 months. Examination shows no abnormalities. Which of the following is the most appropriate contraceptive method for this patient at this time?

A) Use of a latex condom by her husband
B) Combination oral contraceptive therapy
C) Progesterone-only oral contraceptive therapy
D) Vaginal contraceptive ring
E) Levonorgestrel IUD

Correct Answer: E.

A variety of contraceptive options exist, each with different efficacy rates, advantages, and contraindications. Of the options listed, the best option for this patient would be a levonorgestrel intrauterine device (IUD). An IUD is a long-acting reversible contraceptive option that does not require active compliance on the part of the patient. Both copper and levonorgestrel IUDs are available. The copper IUD provides a contraceptive method without the use of hormones, since copper is spermicidal and inhibits the acrosomal reaction necessary for fertilization. It also causes local inflammatory changes of the endometrium and increases cervical mucus production, further decreasing the chance of successful sperm passage or embryonic implantation in the endometrium. Hormonal IUDs also cause cervical mucous thickening and induce glandular atrophy of the endometrium, preventing embryonic implantation. IUDs are a reliable form of contraception with failure rates as low as 1%. They are safe to use in breastfeeding women and, depending on the type, may be kept in place for up to 10 years.

Incorrect Answers: A, B, C, and D.

Use of a latex condom by her husband (Choice A) will not be as effective in preventing pregnancy as the placement of an IUD. Condoms require consistent use and are less than 90% effective with typical use, as compared with the 99% efficacy of an IUD.

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E) Levonorgestrel IUD

Correct Answer: E.

A variety of contraceptive options exist, each with different efficacy rates, advantages, and contraindications. Of the options listed, the best option for this patient would be a levonorgestrel intrauterine device (IUD). An IUD is a long-acting reversible contraceptive option that does not require active compliance on the part of the patient. Both copper and levonorgestrel IUDs are available. The copper IUD provides a contraceptive method without the use of hormones, since copper is spermicidal and inhibits the acrosomal reaction necessary for fertilization. It also causes local inflammatory changes of the endometrium and increases cervical mucus production, further decreasing the chance of successful sperm passage or embryonic implantation in the endometrium. Hormonal IUDs also cause cervical mucous thickening and induce glandular atrophy of the endometrium, preventing embryonic implantation. IUDs are a reliable form of contraception with failure rates as low as 1%. They are safe to use in breastfeeding women and, depending on the type, may be kept in place for up to 10 years.

Incorrect Answers: A, B, C, and D.

Use of a latex condom by her husband (Choice A) will not be as effective in preventing pregnancy as the placement of an IUD. Condoms require consistent use and are less than 90% effective with typical use, as compared with the 99% efficacy of an IUD.

Combination oral contraceptive therapy (Choice B) would be an inappropriate choice in this patient. Not only is it less effective than an IUD, but it can also interfere with breastfeeding.

Progesterone-only oral contraceptive therapy (Choice C) would be a less effective choice in this patient. Not only does it require strict compliance in that it must be taken every day at the same time, but it also has an approximately 92% chance of preventing pregnancy with typical use.

Vaginal contraceptive ring (Choice D) is less effective than an IUD, preventing pregnancy approximately 90% of the time. Additionally, the estrogen in the ring can interfere with breastfeeding.

Educational Objective: IUDs are an effective, long-acting, reversible contraceptive option for patients who desire reliable birth control. Copper and hormonal options are available, with copper IUDs being effective for up to 10 years and hormonal IUDs being effective for up to 5 years. Both have failure rates as low as 1% and are safe to use in breastfeeding patients.

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48. A 37-year-old woman comes to the physician because of a 1-year history of irregular menses. During this time, menses have occurred at irregular 3-month intervals and have lasted for 10 days with moderately heavy flow. She has no history of serious illness and takes no medications. She is 168 cm (5 ft 6 in) tall and weighs 68 kg (150 lb); BMI is 24 kg/m^2. Her temperature is 37.1°C (98.7°F), pulse is 70/min, respirations are 12/min, and blood pressure is 90/50 mm Hg. Visual field testing shows outer field deficits bilaterally. A milky white discharge can be expressed from both breasts. The remainder of the examination, including pelvic examination, shows no abnormalities. Test of the stool for occult blood is negative. Her serum prolactin concentration is 40 ng/mL. An MRI of the brain shows a pituitary microadenoma. Which of the following is the most appropriate next step in management?

A) Bromocriptine therapy
B) Oral contraceptive therapy
C) Radioactive iodine therapy
D) Extracranial stereotactic radioablation
E) Transsphenoidal resection of the microadenoma

Correct Answer: A.

Bromocriptine therapy is the most appropriate next step in management of this patient with a pituitary microadenoma. The pituitary gland is located in the sella turcica, which is located just superior to the optic chiasm. A pituitary adenoma is a benign brain tumor that can present with mass effect symptoms such as headache and bitemporal hemianopsia (loss of bilateral temporal visual fields) as in this patient. Bitemporal hemianopsia occurs as a result of mass effect of the tumor on the optic chiasm, which contains crossing fibers from bilateral nasal optic nerves (containing visual information from the temporal eye fields). Pituitary adenomas can also cause symptoms from hyperpituitarism or hypopituitarism, depending on whether the tumor is functionally secreting hormones. The most common functional pituitary adenoma is a prolactinoma; other types of pituitary adenomas secrete follicle-stimulating hormone (FSH), luteinizing hormone (LH), adrenocorticotropic hormone, TSH, or growth hormone, but these are far less common. Prolactinomas suppress gonadotropin-releasing hormone, which results in decreased FSH and LH production and manifests as amenorrhea. Additionally, if a pituitary adenoma is nonfunctional and large, it can interfere with normal hormone secretion by the pituitary gland, causing hypopituitarism. In this setting, decreased secretion of FSH and LH could also manifest as amenorrhea. Bromocriptine is a dopamine agonist that is used to treat prolactin-secreting pituitary adenomas since dopamine inhibits the production of prolactin. Tumors that are refractory to bromocriptine may need to be removed surgically.

Incorrect Answers: B, C, D, and E

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which is located just superior to the optic chiasm. A pituitary adenoma is a benign brain tumor that can present with mass effect symptoms such as headache and bitemporal hemianopsia (loss of bilateral temporal visual fields) as in this patient. Bitemporal hemianopsia occurs as a result of mass effect of the tumor on the optic chiasm, which contains crossing fibers from bilateral nasal optic nerves (containing visual information from the temporal eye fields). Pituitary adenomas can also cause symptoms from hyperpituitarism or hypopituitarism, depending on whether the tumor is functionally secreting hormones. The most common functional pituitary adenoma is a prolactinoma; other types of pituitary adenomas secrete follicle-stimulating hormone (FSH), luteinizing hormone (LH), adrenocorticotropic hormone, TSH, or growth hormone, but these are far less common. Prolactinomas suppress gonadotropin-releasing hormone, which results in decreased FSH and LH production and manifests as amenorrhea. Additionally, if a pituitary adenoma is nonfunctional and large, it can interfere with normal hormone secretion by the pituitary gland, causing hypopituitarism. In this setting, decreased secretion of FSH and LH could also manifest as amenorrhea. Bromocriptine is a dopamine agonist that is used to treat prolactin-secreting pituitary adenomas since dopamine inhibits the production of prolactin. Tumors that are refractory to bromocriptine may need to be removed surgically.

Incorrect Answers: B, C, D, and E.

Oral contraceptive therapy (Choice B) is considered for patients who have polycystic ovary syndrome leading to irregular menstruation. This patient's clinical presentation is not consistent with this diagnosis.

Radioactive iodine therapy (Choice C) is indicated for patients with hyperthyroidism secondary to Graves disease. Iodine is selectively taken up by the hyperactive thyroid gland, resulting in destruction of the thyroid and iatrogenic hypothyroidism. This patient does not have evidence of Graves disease.

Extracranial stereotactic radioablation (Choice D) is considered for large prolactin-secreting adenomas that are refractory to dopamine agonists and surgery. It is not indicated in this treatment-naive patient with a microadenoma.

Transsphenoidal resection of the microadenoma (Choice E) is only indicated for the treatment of prolactin-secreting pituitary microadenomas after a failed trail of bromocriptine.

Educational Objective: Pituitary adenomas can cause mass effect symptoms such as headache and bitemporal hemianopsia from compression of the adjacent optic chiasm. Additionally, they may be functional or nonfunctional in nature. When functional, this can result in the hypersecretion of hormones, most commonly prolactin, which typically manifests with amenorrhea and galactorrhea in female patients. First-line treatment of prolactin-secreting pituitary microadenomas is with a dopamine agonist such as bromocriptine, which suppresses prolactin secretion.

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49. A 67-year-old woman comes to the physician because she has had a lesion on her right eyelid for 3 months. She has no history of similar lesions. Examination shows a 2 x 1.5-cm lesion on the lower lid of the right eye. A biopsy specimen of the lesion shows basal cell carcinoma. Which of the following is the most appropriate next step in management?

A) Wide (1-cm) excision
B) Cryoablation
C) Chemotherapy
D) Radiation therapy
E) Mohs micrographic surgery

Correct Answer: E.

The most appropriate next step in management of a basal cell carcinoma (BCC) on the eyelid is Mohs micrographic surgery. BCC is the most common form of skin cancer and typically presents as a pink, pearly papule or nodule with rolled borders and central ulceration most commonly on the sun-exposed areas of the head and neck. The risk for basal cell carcinoma metastasis is extremely low, though it can invade locally and cause significant tissue damage. Treatment of basal cell carcinoma requires surgical removal, either via excision or Mohs micrographic surgery. Excision and Mohs micrographic surgery differ in three important ways. First, when excision is performed, a margin of normal tissue is excised around the clinically visualized tumor, and the entire specimen is sent for pathologic review in formalin. When the specimen is processed in the pathology laboratory, it is sectioned into slices that are several microns thick. Because it is impractical to evaluate each slice in its entirety, three to four slices are selected for review of the margins. This technique only evaluates approximately 2% of the margins. For aggressive histologic subtypes of basal cell carcinoma, this is inadequate to ensure complete removal of the tumor. In comparison, Mohs micrographic surgery utilizes “en face” sectioning in which the entire margin including the edges and bottom of the specimen are cut in a way that allows it to lie flat on the slide. Using this technique, 100% of the margins are assessed. Second, an excision is performed by a dermatologic surgeon and examined by a pathologist while Mohs micrographic surgery is performed and histopathologically examined entirely by the operating dermatologic surgeon. This allows for the orientation of the tumor to be preserved so the surgeon can return to the patient after reviewing the pathology and remove additional tumor if necessary. Third, Mohs micrographic surgery is tissue-sparing since it allows for a smaller margin of normal tissue to be removed around the tumor. This decreases the area of skin removed, which is valuable in sites important for function or cosmesis, such as the lower eyelid. Mohs micrographic surgery is favored over excision for basal cell carcinoma on the head and neck or when aggressive BCC subtypes are present outside the head and neck.

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The most appropriate next step in management of a basal cell carcinoma (BCC) on the eyelid is Mohs micrographic surgery. BCC is the most common form of skin cancer and typically presents as a pink, pearly papule or nodule with rolled borders and central ulceration most commonly on the sun-exposed areas of the head and neck. The risk for basal cell carcinoma metastasis is extremely low, though it can invade locally and cause significant tissue damage. Treatment of basal cell carcinoma requires surgical removal, either via excision or Mohs micrographic surgery. Excision and Mohs micrographic surgery differ in three important ways. First, when excision is performed, a margin of normal tissue is excised around the clinically visualized tumor, and the entire specimen is sent for pathologic review in formalin. When the specimen is processed in the pathology laboratory, it is sectioned into slices that are several microns thick. Because it is impractical to evaluate each slice in its entirety, three to four slices are selected for review of the margins. This technique only evaluates approximately 2% of the margins. For aggressive histologic subtypes of basal cell carcinoma, this is inadequate to ensure complete removal of the tumor. In comparison, Mohs micrographic surgery utilizes “en face” sectioning in which the entire margin including the edges and bottom of the specimen are cut in a way that allows it to lie flat on the slide. Using this technique, 100% of the margins are assessed. Second, an excision is performed by a dermatologic surgeon and examined by a pathologist while Mohs micrographic surgery is performed and histopathologically examined entirely by the operating dermatologic surgeon. This allows for the orientation of the tumor to be preserved so the surgeon can return to the patient after reviewing the pathology and remove additional tumor if necessary. Third, Mohs micrographic surgery is tissue-sparing since it allows for a smaller margin of normal tissue to be removed around the tumor. This decreases the area of skin removed, which is valuable in sites important for function or cosmesis, such as the lower eyelid. Mohs micrographic surgery is favored over excision for basal cell carcinoma on the head and neck or when aggressive BCC subtypes are present outside the head and neck.

Incorrect Answers: A, B, C, and D.

Wide (1-cm) excision (Choice A) is not appropriate for management of a BCC on the lower eyelid since it does not provide 100% margin assessment and increases the risk for recurrence. Further, wide excision is not possible on the lower eyelid without causing permanent disfigurement and functional impairment to the patient.

Cryoablation (Choice B) is inferior to surgical removal of BCC because of a high recurrence rate. Given its location on the lower eyelid, this BCC is appropriate for treatment with Mohs micrographic surgery.

Chemotherapy (Choice C) and radiation therapy (Choice D) are not necessary in this case since surgical treatment is feasible and will be curative.

Educational Objective: Depending on the location and histologic subtype, BCC may be surgically treated with Mohs micrographic surgery or wide excision. Mohs micrographic surgery is more appropriate for lesions of the head and neck given the need for tissue conservation and complete margin assessment.

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50. A 3-month-old boy is brought to the physician for evaluation of delayed growth. He was born at term following an uncomplicated pregnancy and delivery. There was no cyanosis at birth. His mother says that he feeds poorly and turns blue around the lips and fingers during feedings. He frequently cries and becomes restless, short of breath, and cyanotic. He is at the 20th percentile for length and 10th percentile for weight. During the examination, he has paroxysms of crying during which he becomes cyanotic; his color is normal at rest. A grade 3/6, systolic ejection murmur is heard at the left sternal border. Which of the following is the most likely diagnosis?

A) Aortic stenosis
B) Atrial septal defect
C) Coarctation of the aorta
D) Patent ductus arteriosus
E) Tetralogy of Fallot
F) Transposition of the great arteries
G) Truncus arteriosus
H) Ventricular septal defect

Correct Answer: E.

Tetralogy of Fallot is the most likely diagnosis in this infant with paroxysmal cyanosis during crying spells and a 3/6 systolic ejection murmur on examination. Tetralogy of Fallot consists of pulmonary infundibular stenosis, overriding aorta, ventricular septal defect (VSD), and right ventricular hypertrophy, resulting in a right-to-left shunt with cyanosis first noted in infancy. Right ventricular outflow tract (RVOT) obstruction eventually leads to right ventricular hypertrophy. The murmur heard with tetralogy of Fallot, which is typically a holosystolic murmur best heard in the left lower sternal border, is caused by RVOT obstruction, not as often as by the VSD. Paroxysmal cyanosis that occurs during periods of crying is a classic presentation and these episodes are referred to as “tet” spells. Patients in the midst of one of these spells often exhibit rapid, deep breathing, agitation, and progressive cyanosis. These periods of cyanosis occur as a result of transient obstruction or occlusion of the RVOT leading to decreased blood flow through the pulmonary circulation, although the cause of the underlying transient obstruction is unclear. Treatment of tetralogy of Fallot is with surgical correction. Surgery aims to relieve the RVOT obstruction, close the VSD, and separate the pulmonary and systemic circulation. Surgery is usually performed in

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G) Truncus arteriosus

H) Ventricular septal defect

Correct Answer: E.

Tetralogy of Fallot is the most likely diagnosis in this infant with paroxysmal cyanosis during crying spells and a 3/6 systolic ejection murmur on examination. Tetralogy of Fallot consists of pulmonary infundibular stenosis, overriding aorta, ventricular septal defect (VSD), and right ventricular hypertrophy, resulting in a right-to-left shunt with cyanosis first noted in infancy. Right ventricular outflow tract (RVOT) obstruction eventually leads to right ventricular hypertrophy. The murmur heard with tetralogy of Fallot, which is typically a holosystolic murmur best heard in the left lower sternal border, is caused by RVOT obstruction, not as often as by the VSD. Paroxysmal cyanosis that occurs during periods of crying is a classic presentation and these episodes are referred to as “tet” spells. Patients in the midst of one of these spells often exhibit rapid, deep breathing, agitation, and progressive cyanosis. These periods of cyanosis occur as a result of transient obstruction or occlusion of the RVOT leading to decreased blood flow through the pulmonary circulation, although the cause of the underlying transient obstruction is unclear. Treatment of tetralogy of Fallot is with surgical correction. Surgery aims to relieve the RVOT obstruction, close the VSD, and separate the pulmonary and systemic circulation. Surgery is usually performed in the first 6 months of life and almost always within the first year.

Incorrect Answers: A, B, C, D, F, G, and H.

Aortic stenosis (Choice A) is uncommon in children but presents with a systolic murmur that radiates to the carotids. It can present with exertional syncope when severe but does not cause cyanosis.

Atrial septal defect (Choice B) is a common congenital malformation of the interatrial septum that results in a left-to-right shunt between the atria. Mixing of oxygenated blood from the left atrium with deoxygenated blood returning from the superior vena cava results in higher oxygen concentration in the right atrium and ventricle than normal. It does not cause cyanosis.

Coarctation of the aorta (Choice C) often presents in childhood with hypertension in an upper extremity and a systolic murmur. It is associated with weak lower extremity pulses and differentially lower blood pressure in the lower extremities.

Patent ductus arteriosus (Choice D) is a persistent conduit between the aorta and the pulmonary artery that has failed to obliterate. It results in a continuous, machine-like murmur heard in the left second intercostal space, radiating to the clavicle.

Transposition of the great arteries (Choice F) results in aberrant reversal of the normal anatomical association of the aorta and pulmonary artery to the cardiac chambers

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decreased blood flow through the pulmonary circulation, although the cause of the underlying transient obstruction is unclear. Treatment of tetralogy of Fallot is with surgical correction. Surgery aims to relieve the RVOT obstruction, close the VSD, and separate the pulmonary and systemic circulation. Surgery is usually performed in the first 6 months of life and almost always within the first year.

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Transposition of the great arteries (Choice F) results in aberrant reversal of the normal anatomical association of the aorta and pulmonary artery to the cardiac chambers secondary to failure of the aorticopulmonary septum to spiral. This results in separate systemic and pulmonary circulations, with the aorta leaving the right ventricle and the pulmonary trunk leaving the left ventricle. This is incompatible with life unless an additional shunt allowing admixture of blood is present.

Truncus arteriosus (Choice G) results from failure of the aorticopulmonary septum to divide the aorta and pulmonary trunk. Most patients present with a concomitant ventricular septal defect and cyanosis noted in the neonatal period, but cyanosis is not paroxysmal.

Ventricular septal defect (Choice H) refers to a defect in the interventricular septum, most commonly the membranous portion. It is characterized by a holosystolic murmur best heard in the left lower sternal border. It does not cause cyanosis.

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1. A 17-year-old girl is brought to the emergency department by her father after she had loss of consciousness and collapsed on the sidewalk during an afternoon run. Her father says that his daughter is overweight and has been trying to lose weight for the past 2 months. In addition to modifying her diet, she has been running 2 to 3 miles daily during the past month. She has no history of serious illness and takes no medications. On questioning, her father says that his daughter is a "good kid" but occasionally attends parties, where alcohol is served; he is unsure whether she has used illicit drugs. On arrival, she is somnolent but arousable and responsive. She is oriented to person but not to place or time. She is 168 cm (5 ft 6 in) tall and weighs 85 kg (187 lb); BMI is 30 kg/m^2. Her temperature is 39°C (102.2°F), pulse is 140/min, respirations are 40/min, and blood pressure is 105/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 97%. Examination shows cool, clammy, dry skin. The pupils are equal and reactive to light. No other abnormalities are noted. Which of the following is the most likely diagnosis?

A) Congestive heart failure
B) Heat exhaustion
C) Illicit drug use
D) Sepsis
E) Vasovagal syncope

Correct Answer: B.

Heat exhaustion or heat stroke can occur during strenuous exercise in hot temperatures and increased humidity. Other risk factors include lack of acclimatization, obesity, dehydration, and poor physical fitness. During exertion, the body is able to dissipate heat by increasing blood flow to the skin and producing sweat to facilitate evaporative cooling. However, when ambient temperature is increased and humidity is high, these mechanisms are less effective at dissipating heat, potentially resulting in heat exhaustion or heat stroke. Heat exhaustion is characterized by exercise intolerance, increased core body temperature, and the absence of neurologic disturbances (eg, altered mental status, confusion, or seizure). Heat stroke is characterized by hyperthermia, altered mental status or neurologic deficits, and variable physical signs and symptoms depending on severity. In this case, this patient was susceptible to overheating from the environment and her run. Results of laboratory studies may show hypernatremia, hyperchloremia, and hyperkalemia along with increased serum creatinine, blood urea nitrogen, and creatine kinase concentrations. Management of heat-related illness involves removing the individual from the heat, removing excess clothing, and initiating cooling measures such as immersion in cool water or evaporative cooling.

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Incorrect Answers: A, C, D, and E.

Congestive heart failure (Choice A) would be unlikely in a previously healthy teenager and would present with cool extremities, lower extremity edema, pulmonary edema, or other signs of volume overload. This patient has no history of cardiac disease or signs of volume overload, making congestive heart failure unlikely.

Illicit drug use (Choice C) with sympathomimetics, such as cocaine or methamphetamine, can also present with tachycardia and increased body temperature. Sympathomimetics typically cause diaphoresis, mydriasis, and agitation. In this patient who was previously exercising, heat exhaustion is more likely.

Sepsis (Choice D) would also present with tachycardia and fever, but this patient has no focal signs of infection and presents after an acute episode while exercising, which is more consistent with heat exhaustion.

Vasovagal syncope (Choice E) occurs in the setting of certain physical or emotional triggers such as pain or emotional distress. It is characterized by a decrease in venous return, preload, and cardiac output, and loss of vasomotor tone, resulting in an abrupt drop in mean arterial pressure. The combination of these factors can result in significantly reduced cerebral blood flow and consequent syncope.

Educational Objective: Heat exhaustion or heat stroke can occur in the setting of strenuous exercise in hot temperatures and increased humidity. Heat exhaustion is characterized by exercise intolerance, increased core body temperature, and the absence of neurologic disturbances (eg, altered mental status, confusion, or seizure).

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2. A 72-year-old man is brought to the emergency department 2 hours after a generalized tonic-clonic seizure that lasted 5 minutes. He has no other history of seizures. His wife reports that the patient has been increasingly forgetful during the past 3 months. He also has had increasingly frequent jerk-like movements of the arms and legs. Three times during the past week, he did not recognize his wife when he saw her enter a room, but he recognized her voice. He has hypercholesterolemia treated with atorvastatin. He drinks three to four beers nightly. Examination shows involuntary jerking of the head, trunk, and all extremities. There are fasciculations of all extremities. On mental status examination, he has a normal mood and affect. He is alert and is able to repeat six digits forward. He recalls two of five parts of a name and address after 5 minutes. When shown a sketch of a pretzel, he identifies it as a snake. Which of the following is the most likely diagnosis?

A) Creutzfeldt-Jakob disease
B) Dementia, Alzheimer type
C) Dementia, frontotemporal
D) Dementia, Lewy body
E) Subdural hematoma
F) Thalamic glioma
G) Wernicke-Korsakoff syndrome

Correct Answer: A.

This patient's signs and symptoms of rapidly progressive dementia and ataxia are consistent with a diagnosis of Creutzfeldt-Jakob disease (CJD). CJD is a human prion disease in which prion proteins replicate throughout the brain and cause neurotoxicity. Patients typically present with neuropsychiatric symptoms (eg, dementia, anxiety, behavioral disturbances, deficits in higher cortical functions such as aphasia and visual agnosia), cerebellar manifestations (eg, ataxia), corticospinal tract dysfunction (eg, spastic weakness), and basal ganglia signs (eg, hypokinesia, rigidity). Stimulus-induced or spontaneous myoclonus is a specific sign of CJD. Over time, the disease rapidly progresses, invariably leading to death within a year. A probable CJD diagnosis can be made clinically and through cerebrospinal fluid analysis; an autopsy showing spongiform degeneration of the cortex confirms the diagnosis. Treatment is supportive (eg, hospice evaluation, education, benzodiazepines for myoclonus).

Incorrect Answers: B, C, D, E, F, and G.

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G) Wernicke-Korsakoff syndrome

Correct Answer: A.

This patient's signs and symptoms of rapidly progressive dementia and ataxia are consistent with a diagnosis of Creutzfeldt-Jakob disease (CJD). CJD is a human prion disease in which prion proteins replicate throughout the brain and cause neurotoxicity. Patients typically present with neuropsychiatric symptoms (eg, dementia, anxiety, behavioral disturbances, deficits in higher cortical functions such as aphasia and visual agnosia), cerebellar manifestations (eg, ataxia), corticospinal tract dysfunction (eg, spastic weakness), and basal ganglia signs (eg, hypokinesia, rigidity). Stimulus-induced or spontaneous myoclonus is a specific sign of CJD. Over time, the disease rapidly progresses, invariably leading to death within a year. A probable CJD diagnosis can be made clinically and through cerebrospinal fluid analysis; an autopsy showing spongiform degeneration of the cortex confirms the diagnosis. Treatment is supportive (eg, hospice evaluation, education, benzodiazepines for myoclonus).

Incorrect Answers: B, C, D, E, F, and G.

Dementia, Alzheimer type (Choice B), presents with progressive cognitive decline that begins with short-term memory impairment along with decline in visuospatial abilities and progresses to apraxia, language abnormalities, and dysexecutive syndrome. Cognitive deficits typically develop over years rather than months, and seizures and myoclonus are uncommon.

Dementia, frontotemporal (Choice C), is a neurodegenerative disorder characterized by atrophy of the frontal and temporal lobes, causing deficits in social behavior or personality along with dementia. Cognitive deficits typically develop over years rather than months, and seizures and myoclonus are uncommon.

Dementia, Lewy body (Choice D), is a common dementia that is associated with cognitive fluctuations, visual hallucinations, REM sleep behavior disorder, and parkinsonism (eg, bradykinesia, resting tremor, muscle rigidity, postural instability). Cognitive deficits typically develop over years rather than months, and seizures and myoclonus are uncommon.

In subdural hematoma (SDH) (Choice E), patients may present with headaches, vomiting, meningismus, or manifest upper motoneuron examination findings such as spastic muscle weakness, hyperreflexia, and extensor plantar reflex (Babinski sign). In severe cases, the SDH may compress adjacent brain parenchyma; the displacement of the cerebral hemisphere can result in focal neurologic deficits, altered mental status, seizures, herniation syndromes, and signs of increased intracranial pressure. This patient does not endorse headaches, meningismus, or vomiting. Myoclonus would be atypical.

Thalamic glioma (Choice F) is a rare tumor that may present variably with sensory deficits and impaired vigilance. Myoclonus, rapidly progressive dementia, and cortical

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showing spongiform degeneration of the cortex confirms the diagnosis. Treatment is supportive (eg, hospice evaluation, education, benzodiazepines for myoclonus).

Incorrect Answers: B, C, D, E, F, and G.

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Thalamic glioma (Choice F) is a rare tumor that may present variably with sensory deficits and impaired vigilance. Myoclonus, rapidly progressive dementia, and cortical signs (eg, visual agnosia) would be atypical.

Wernicke-Korsakoff (Choice G) syndrome, caused by chronic alcohol use disorder, is characterized by altered mental status, ophthalmoplegia, ataxia, and retrograde and anterograde amnesia. Myoclonus and seizures would be atypical.

Educational Objective: Creutzfeldt-Jakob disease is a human prion disease that presents with rapidly progressing dementia, neuropsychiatric symptoms, cerebellar dysfunction, corticospinal tract dysfunction, basal ganglia dysfunction, and/or spontaneous or stimulus-induced myoclonus.

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3. A 37-year-old woman comes to the physician for a second opinion regarding a positive *Chlamydia trachomatis* DNA hybridization test done by her primary physician 2 weeks ago. The patient has been in a mutually monogamous heterosexual relationship for the past 7 years. She does not doubt her partner's fidelity, and she disbelieves the results. She has no history of serious illness and takes no medications. Pelvic examination shows normal vaginal discharge, an IUD string at the cervical os, and normal cervical mucus. There is no pelvic tenderness. The physician is aware that the prevalence of *C. trachomatis* infection in this patient's age group is less than 1%; the sensitivity of the test is 80%, and the specificity is 97%. Which of the following best explains the validity of the test results to this patient?

A) Accuracy
B) Negative likelihood ratio
C) Negative predictive value
D) Positive likelihood ratio
E) Positive predictive value

Correct Answer: E.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Positive predictive value (PPV) and negative predictive value (NPV) are statistical measures that define the proportion of positive and negative test results that are true positives (positive tests in patients who have the condition) and true negatives (negative tests in patients without the condition), respectively. PPV is thus defined as (true positives (TP)) / (TP + false positives (FP)), or the true positive rate; it measures the probability of a patient actually having the disease given a positive test result. NPV is defined as (true negatives (TN)) / (TN + false negatives (FN)), or the true negative rate; it measures the probability of a patient being disease-free given a negative test result. Both PPV and NPV vary with disease prevalence; PPV varies directly with prevalence whereas NPV varies inversely with prevalence. Therefore, the prevalence of a disease must also be known in order to interpret the positive predictive value of the test. In this case, the patient is wondering whether her positive test result is a true positive. As the PPV gives the probability of a patient having the disease in light of a positive test, this statistic is the best suited to address this patient's concern. Low pretest probability increases the likelihood that this test result is a false positive.

Incorrect Answers: A, B, C, and D.

Accuracy (Choice A) of a test is the proportion of all test results that are correct, whether true positive or true negative. It is calculated as (TP + TN) / total number of

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Correct Answer: E.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Positive predictive value (PPV) and negative predictive value (NPV) are statistical measures that define the proportion of positive and negative test results that are true positives (positive tests in patients who have the condition) and true negatives (negative tests in patients without the condition), respectively. PPV is thus defined as (true positives (TP)) / (TP + false positives (FP)), or the true positive rate; it measures the probability of a patient actually having the disease given a positive test result. NPV is defined as (true negatives (TN)) / (TN + false negatives (FN)), or the true negative rate; it measures the probability of a patient being disease-free given a negative test result. Both PPV and NPV vary with disease prevalence; PPV varies directly with prevalence whereas NPV varies inversely with prevalence. Therefore, the prevalence of a disease must also be known in order to interpret the positive predictive value of the test. In this case, the patient is wondering whether her positive test result is a true positive. As the PPV gives the probability of a patient having the disease in light of a positive test, this statistic is the best suited to address this patient's concern. Low pretest probability increases the likelihood that this test result is a false positive.

Incorrect Answers: A, B, C, and D.

Accuracy (Choice A) of a test is the proportion of all test results that are correct, whether true positives or true negatives. It is calculated as (TP + TN) / total number of tests. While it may be helpful in explaining the validity of the test, the PPV will better address her specific result and the likelihood that she has a *Chlamydia trachomatis* infection given her pretest probability.

Negative likelihood ratio (Choice B) is the ratio of FN to TN. It can be calculated as the ratio of 1-sensitivity to specificity. Negative predictive value (Choice C) conveys the probability that a patient does not have the disease given a negative test. Since this patient had a positive test, neither the negative likelihood ratio nor the NPV of the test in question are relevant to her at this time.

Positive likelihood ratio (Choice D) is the ratio of TP to FP. It can be calculated as the ratio of sensitivity to 1-specificity. A likelihood ratio of >1 conveys that a positive result is more likely to be a TP than an FP. In this case, the PPV will provide the patient more detailed information about her result given her pretest probability than would the positive likelihood ratio.

Educational Objective: Positive predictive value and negative predictive value are statistical measures that define the proportion of positive and negative test results that are true positives and true negatives, respectively. The PPV is best suited to explain the likelihood of disease being present in a patient with a positive test.

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4. A 7-month-old girl is brought to the physician because of a 2-day history of rapid breathing, sweating, pallor, decreased feeding, and increased fussiness. The mother says the patient had the same symptoms 3 weeks ago, but they were less severe and resolved spontaneously in less than 1 day. The patient is alert and fussy. She is at the 50th percentile for length and weight. Her temperature is 37.3°C (99.1°F), pulse is 220/min, respirations are 48/min, and blood pressure is 62/42 mm Hg. Capillary refill time is 3 seconds. Examination shows pink skin. The liver edge is palpated 3 cm below the right costal margin. The remainder of the examination shows no abnormalities. An ECG shows narrow complex tachycardia. Which of the following is the most appropriate next step in management?

A) 24-Hour ambulatory ECG monitoring
B) Echocardiography
C) Intravenous adenosine therapy
D) Intravenous digoxin therapy
E) Intravenous propranolol therapy

Correct Answer: C.

Supraventricular tachycardia (SVT) commonly occurs in children and infants, and is characterized by paroxysmal episodes of rapid, narrow-complex tachycardia. SVT is often idiopathic and paroxysmal but may occur secondary to accessory pathways in some children with Wolff-Parkinson-White syndrome. Diagnosis is made by ECG, although some children may require cardiac monitoring to capture a paroxysmal event. AV nodal blockade with intravenous adenosine therapy is the first-line treatment for narrow complex SVT. Adenosine is a purine analogue that acts on the adenosine receptor, a G protein-coupled receptor that signals through adenylate cyclase. In the AV node, binding of the adenosine A_1 receptor leads to cellular hyperpolarization and reduced transmission of supraventricular action potentials. If adenosine fails, synchronized cardioversion may be attempted. Children who are old enough may be trained to use vagal maneuvers to naturally induce AV nodal blockade. A similar vagal maneuver may be attempted by placing an ice bag over the eyes and face for approximately 30 seconds.

Incorrect Answers: A, B, D, and E.

24-Hour ambulatory ECG monitoring (Choice A) is not appropriate for a patient with symptomatic and already-diagnosed supraventricular tachycardia. The patient requires acute management. Similarly, echocardiography (Choice B) may be used to evaluate for underlying structural heart disease that may predispose the patient to

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B) Echocardiography

C) Intravenous adenosine therapy

D) Intravenous digoxin therapy

E) Intravenous propranolol therapy

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

24-Hour ambulatory ECG monitoring (Choice A) is not appropriate for a patient with symptomatic and already-diagnosed supraventricular tachycardia. The patient requires acute management. Similarly, echocardiography (Choice B) may be used to evaluate for underlying structural heart disease that may predispose the patient to arrhythmias, but the diagnostic work-up should wait until the acute episode is effectively managed.

Intravenous digoxin therapy (Choice D) is useful in the management of congestive heart failure as well as atrial fibrillation and flutter. It is not used in the treatment of SVT.

Intravenous propranolol therapy (Choice E) can be utilized as a second-line agent if vagal maneuvers and intravenous adenosine fail to abort the tachyarrhythmia.

Educational Objective: Supraventricular tachycardia commonly occurs in children and infants, and it is characterized by paroxysmal episodes of rapid, narrow-complex tachycardia. AV nodal blockade with adenosine is the first-line treatment. In the AV node, binding the adenosine A1 receptor leads to cellular hyperpolarization and reduced transmission of supraventricular action potentials.

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5. A 67-year-old woman is brought to the physician because of a 2-week history of increasingly blurred vision. Two months ago, she was hospitalized for 10 days for management of tuberculous meningitis; treatment with ethambutol, isoniazid, prednisone, pyrazinamide, pyridoxine, and rifampin was started at that time. She had been feeling well since discharge. Her only other medication is lisinopril for hypertension. She has no other history of serious illness. Her blood pressure is 125/70 mm Hg. Examination shows a best-corrected visual acuity of 20/50 bilaterally. Visual field examination shows decreased vision in the center of each field. Peripheral vision is normal. A mild-to-moderate decrease in color vision is noted bilaterally. The remainder of the examination shows no abnormalities. Toxicity from which of the following is the most likely cause of this patient's blurred vision?

A) Ethambutol
B) Isoniazid
C) Prednisone
D) Pyrazinamide
E) Pyridoxine
F) Rifampin

Correct Answer: A.

Tuberculosis is a leading cause of death worldwide and is caused by the organism *Mycobacterium tuberculosis*. Infection occurs through inhalation of aerosol droplets containing the bacteria and can manifest as primary disease or latent infection with risk for reactivation. Tuberculosis can involve multiple organ systems. Effective treatment requires a multi-agent antimycobacterial regimen because of high rates of resistance. Ethambutol has been proposed to act by inhibition of mycobacterial cell wall synthesis and is frequently used as a first-line agent for treating tuberculosis. The primary adverse effects include optic neuropathy, neutropenia, and thrombocytopenia. Optic neuropathy may present with decreased visual acuity, scotoma, red-green color blindness, and other visual defects such as blurred vision or partial visual field loss. The presence of ocular toxicity is an indication for discontinuing the drug.

Incorrect Answers: B, C, D, E, and F.

Isoniazid (Choice B) is a common first-line antimycobacterial agent that acts by inhibiting synthesis of mycolic acids utilized in the cell walls of acid-fast bacteria. The

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F) Rifampin

Correct Answer: A.

Tuberculosis is a leading cause of death worldwide and is caused by the organism *Mycobacterium tuberculosis*. Infection occurs through inhalation of aerosol droplets containing the bacteria and can manifest as primary disease or latent infection with risk for reactivation. Tuberculosis can involve multiple organ systems. Effective treatment requires a multi-agent antimycobacterial regimen because of high rates of resistance. Ethambutol has been proposed to act by inhibition of mycobacterial cell wall synthesis and is frequently used as a first-line agent for treating tuberculosis. The primary adverse effects include optic neuropathy, neutropenia, and thrombocytopenia. Optic neuropathy may present with decreased visual acuity, scotoma, red-green color blindness, and other visual defects such as blurred vision or partial visual field loss. The presence of ocular toxicity is an indication for discontinuing the drug.

Incorrect Answers: B, C, D, E, and F.

Isoniazid (Choice B) is a common first-line antimycobacterial agent that acts by inhibiting synthesis of mycolic acids utilized in the cell walls of acid-fast bacteria. The primary adverse effects of isoniazid include hepatotoxicity, neurotoxicity, drug-drug interactions caused by cytochrome P450 enzymatic inhibition, and vitamin B_6 (pyridoxine) deficiency, which manifests with peripheral neuropathy and sideroblastic anemia. Concurrent administration of pyridoxine (Choice E) is recommended to reduce adverse effects.

Prednisone (Choice C) and other corticosteroids may be used in treatment of tuberculous meningitis to reduce cerebral inflammation. Major adverse effects of corticosteroids include anxiety, psychosis, mania, accelerated bone loss, hyperglycemia, cutaneous thinning, Cushing syndrome, and decreased wound healing.

Pyrazinamide (Choice D) is a common first-line antimycobacterial agent with an unknown mechanism of action. Primary adverse effects include hepatotoxicity, hyperuricemia, and arthralgias.

Rifampin (Choice F) is an antimycobacterial agent that increases the activity of cytochrome P450 enzymes in the liver. It also causes bodily fluids to exhibit an orange tint. Additional adverse effects include hepatotoxicity and cutaneous flushing.

Educational Objective: Ethambutol is a first-line antimycobacterial agent commonly used in treatment regimens for tuberculosis. Major toxicities include optic neuropathy, neutropenia, and thrombocytopenia.

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6. A 45-year-old man with alcoholic cirrhosis comes to the physician for a routine examination. His medications are spironolactone and furosemide. He no longer drinks alcohol. He is alert and fully oriented. His temperature is 37°C (98.6°F), pulse is 86/min, respirations are 12/min, and blood pressure is 108/60 mm Hg. Examination shows scattered spider angiomas over the chest and upper abdomen. The abdomen is distended; there is dullness to percussion over the flanks. Which of the following is the most appropriate screening test for this patient?

A) Colonoscopy
B) Esophagogastroduodenoscopy
C) Measurement of serum ammonia concentration
D) Measurement of serum ferritin concentration
E) Serum CA 19-9 assay

Correct Answer: B.

Portal hypertension (PH) is a common complication of liver cirrhosis. The portal venous system describes a series of interconnected veins that drain blood from the colon, small intestines, spleen, liver, and stomach. While this blood eventually makes its way to the systemic circulation through the inferior vena cava, it must first pass through the liver. In cirrhosis, obliteration of the hepatic sinusoids through progressive fibrosis increases the resistance to blood flow through the liver, which is transmitted to the portal venous system causing PH. Anatomically, the portal vein starts at the confluence of the left gastric, splenic, and superior mesenteric veins. Manifestations of PH include esophageal varices, gastric varices, caput medusae, hemorrhoids, splenomegaly, and ascites. Esophageal varices can erode through the mucosa and cause rapid, life-threatening bleeding. Routine screening for the presence of varices with esophagogastroduodenoscopy (EGD) is recommended for patients with cirrhosis.

Incorrect Answers: A, C, D, and E.

Colonoscopy (Choice A) as a routine screening test for colorectal cancer is typically initiated in patients over the age of 50 unless additional risk factors exist (eg, family history at a young age, genetic syndromes such as familial adenomatous polyposis or Lynch syndrome). Additionally, the decision to initiate screening should take into consideration comorbidities and life expectancy.

Measurement of serum ammonia concentration (Choice C) is not recommended as a routine screening test for patients with alcoholic cirrhosis. Increased ammonia

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E) Serum CA 19-9 assay

Correct Answer: B.

Portal hypertension (PH) is a common complication of liver cirrhosis. The portal venous system describes a series of interconnected veins that drain blood from the colon, small intestines, spleen, liver, and stomach. While this blood eventually makes its way to the systemic circulation through the inferior vena cava, it must first pass through the liver. In cirrhosis, obliteration of the hepatic sinusoids through progressive fibrosis increases the resistance to blood flow through the liver, which is transmitted to the portal venous system causing PH. Anatomically, the portal vein starts at the confluence of the left gastric, splenic, and superior mesenteric veins. Manifestations of PH include esophageal varices, gastric varices, caput medusae, hemorrhoids, splenomegaly, and ascites. Esophageal varices can erode through the mucosa and cause rapid, life-threatening bleeding. Routine screening for the presence of varices with esophagogastroduodenoscopy (EGD) is recommended for patients with cirrhosis.

Incorrect Answers: A, C, D, and E.

Colonoscopy (Choice A) as a routine screening test for colorectal cancer is typically initiated in patients over the age of 50 unless additional risk factors exist (eg, family history at a young age, genetic syndromes such as familial adenomatous polyposis or Lynch syndrome). Additionally, the decision to initiate screening should take into consideration comorbidities and life expectancy.

Measurement of serum ammonia concentration (Choice C) is not recommended as a routine screening test for patients with alcoholic cirrhosis. Increased ammonia concentration can be useful in diagnosing hepatic encephalopathy in patients who present with fatigue, mental status changes, and/or obtundation.

Measurement of serum ferritin concentration (Choice D) is used in the diagnosis and monitoring of hemochromatosis. Hemochromatosis and alcohol use are significant synergistic risk factors for development of cirrhosis. In a patient without hemochromatosis, routine screening tests of ferritin are not necessary.

Serum CA 19-9 assay (Choice E) is used in the diagnosis and monitoring of treatment response for certain gastrointestinal malignancies, especially pancreatic cancer. Cirrhosis increases the risk for primary liver cancer, most commonly hepatocellular carcinoma.

Educational Objective: Portal hypertension is a common complication of cirrhosis caused by increased resistance to blood flow through the portal system. This results in splenomegaly, ascites, and portosystemic shunts that can cause esophageal and gastric varices. Screening with EGD for varices is recommended because of the potential for sudden, life-threatening bleeding.

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7. A 19-year-old man is brought to the emergency department 30 minutes after he was involved in a motor vehicle collision. He was the unrestrained driver. A cervical collar and spinal board were placed at the scene. He has no history of serious illness and takes no medications. On arrival, he reports shortness of breath and difficulty breathing, especially in the right side of the chest. His temperature is 36.9°C (98.5°F), pulse is 126/min, respirations are 30/min, and blood pressure is 110/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 78%. Examination shows right-sided supraclavicular fossal distention with inspiration. Which of the following is the most likely diagnosis?

A) Aortic dissection
B) Cardiac contusion
C) Clavicular fracture
D) Esophageal rupture
E) Pericardial hemorrhage
F) Pneumothorax

Correct Answer: F.

Pneumothorax results from air entering the intrapleural space from either an external (eg, stab wound, rib fracture) or internal (eg, ruptured bleb or bronchus, bronchopleural fistula) source. As the air accumulates within the space, the lung parenchyma becomes compressed, resulting in respiratory distress, reduced breath sounds, hyperresonance to percussion, and in severe cases, tension on the mediastinal structures impeding venous return resulting in hypotension. Signs of tension pneumothorax include tachycardia, hypotension, hypoxia, jugular venous distension, and tracheal deviation. In cases of acute tension pneumothorax, evacuating the accumulated air using needle decompression and aspiration permits expansion of the lung and eliminates tension on the great vessels. Needle decompression is followed by tube thoracostomy, which prevents re-accumulation and promotes repair of the pleural defect.

Incorrect Answers: A, B, C, D, and E.

Aortic dissection (Choice A) can occur in deceleration injuries; however, it is rarer. Patients can present with chest pain, hypotension, tachycardia, and a widened mediastinum on chest x-ray. Hypoxia, shortness of breath, and supraclavicular fossal distention with inspiration is more consistent with pneumothorax.

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Incorrect Answers: A, B, C, D, and E.

Aortic dissection (Choice A) can occur in deceleration injuries; however, it is rarer. Patients can present with chest pain, hypotension, tachycardia, and a widened mediastinum on chest x-ray. Hypoxia, shortness of breath, and supraclavicular fossal distention with inspiration is more consistent with pneumothorax.

Cardiac contusion (Choice B) is a potential complication of blunt chest trauma that presents with arrhythmias and/or heart failure. It is often evidenced by external signs of chest trauma such as bruising, rib fractures, or sternal fractures.

Clavicular fracture (Choice C) can occur in blunt trauma, and patients typically present with pain, swelling, and deformity along the affected clavicle. Unless it is accompanied by a pneumothorax, a clavicular fracture itself would not cause hypoxia.

Esophageal rupture (Choice D) can present with dysphagia, sharp chest pain, hematemesis, and subcutaneous emphysema in the chest or neck. Esophageal rupture may occur as a result of trauma, instrumentation during endoscopy, or from violent retching.

Pericardial hemorrhage (Choice E) is more likely in the setting of penetrating chest trauma and can quickly progress to cardiac tamponade, resulting in hypotension, jugular venous distension, and distant heart sounds.

Educational Objective: Pneumothorax occurs when air is able to enter the pleural space but is prevented from exiting. This leads to an increasing amount of air trapped in the pleural space with subsequent collapse of the lung parenchyma and mass effect on the mediastinum. Management involves needle decompression (in cases of tension physiology) followed by tube thoracostomy.

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8. A previously healthy 67-year-old woman is brought to the emergency department because of a 2-hour history of severe upper abdominal pain, nausea, and vomiting. Her symptoms began when her 4-year-old grandson jumped on her abdomen while she was lying on the sofa. She is in acute distress. Her temperature is 37.7°C (99.9°F), pulse is 110/min, respirations are 20/min, and blood pressure is 150/60 mm Hg. Decreased breath sounds are heard in the lung bases bilaterally. Cardiac examination shows no other abnormalities. Abdominal examination shows diffuse tenderness to palpation; bowel sounds are decreased. Laboratory studies show:

Hemoglobin	11 g/dL
Leukocyte count	8500/mm^3
Serum	
Ca^{2+}	7.5 mg/dL
Creatinine	1.9 mg/dL
Total bilirubin	0.9 mg/dL
AST	30 U/L
ALT	29 U/L
Amylase	348 U/L
Lipase	189 U/L (N=14–280)

Which of the following is the most likely diagnosis?

A) Gallstone impaction
B) Intestinal contusion
C) Liver laceration
D) Splenic laceration
E) Traumatic pancreatitis

Correct Answer: E.

Increased serum amylase and lipase activity is commonly seen in acute pancreatitis. Acute pancreatitis presents with severe epigastric abdominal pain that radiates to the

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B) Intestinal contusion
C) Liver laceration
D) Splenic laceration
E) Traumatic pancreatitis

Correct Answer: E.

Increased serum amylase and lipase activity is commonly seen in acute pancreatitis. Acute pancreatitis presents with severe epigastric abdominal pain that radiates to the back, along with nausea and emesis, often in a patient with a history of gallstones, alcoholism, trauma (as in this patient), hypertriglyceridemia, or hypercalcemia. Acute pancreatitis can be complicated by necrosis, hemorrhage, abscess, or the formation of pseudocysts. Laboratory studies often show increased serum amylase and lipase concentrations. Treatment of uncomplicated acute pancreatitis is largely supportive and should include intravenous fluids, either 0.9% saline or lactated ringers, bowel rest, and pain control. Surgical intervention may be required in cases of complications.

Incorrect Answers: A, B, C, and D.

Gallstone impaction (Choice A) can cause acute pancreatitis and may be preceded by other signs of cholelithiasis or choledocholithiasis, including biliary colic. This patient's symptoms are preceded by a history of trauma without report of prior biliary colic, making traumatic pancreatitis more likely.

Intestinal contusion (Choice B) can occur with blunt abdominal trauma and can be difficult to diagnose as it typically does not initially cause any laboratory abnormalities and may be inconspicuous on a CT scan. In a patient with increased amylase and lipase concentrations, pancreatitis is more likely.

Liver (Choice C) or splenic laceration (Choice D) can present with abdominal pain and peritonitis as a result of blood products causing irritation and inflammation of the peritoneum. It would also typically present with focal right upper quadrant or left upper quadrant tenderness, respectively. Epigastric abdominal pain and generalized tenderness to palpation with nausea and vomiting is more consistent with pancreatitis.

Educational Objective: Acute pancreatitis can be caused by trauma, and typically presents with epigastric abdominal pain, nausea, and vomiting. Results of laboratory studies commonly show increased serum amylase and lipase concentrations.

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9. Researchers would like to review the evidence on the association between cigarette smoking and cardiovascular disease. They review a sample of 500 studies published during the past 50 years and note that the increased risk for cardiovascular disease in patients positively correlates with the number of cigarettes smoked daily. The researchers also note that all of these studies are observational. They conclude that this type of study design cannot determine a causal link between smoking and cardiovascular disease, but these studies support one of the criteria for causality. Which of the following best represents the causation criterion met by this type of association?

A) Biologic plausibility
B) Dose-response relationship
C) Specificity of the association
D) Strength of the association
E) Temporal relationship

Correct Answer: B.

Observational studies are able to demonstrate correlation between two variables but not causation. Only prospective studies can verify causation. However, the likelihood that a correlation identified by an observational study is representative of causation increases when certain criteria are present, called the Bradford Hill criteria. These include biologic plausibility, dose-response relationship, specificity and strength of association, and temporal relationship between exposure to one variable and development of the second variable. In this example, the two variables being studied are cardiovascular disease and cigarette smoking. The positive correlation found between increased risk for cardiovascular disease and number of cigarettes smoked daily indicates that as the number of cigarettes smoked daily increased, so does the risk for cardiovascular disease. This is an example of a dose-response relationship. The number of cigarettes smoked daily is considered the dose, and risk for cardiovascular disease is considered the response. The positive correlation between the two is more suggestive of causation than if the risk for cardiovascular disease were the same no matter what number of cigarettes were smoked daily. Thus, the presence of a dose-response relationship in this study is one criterion for causality.

Incorrect Answers: A, C, D, and E.

If an observed association can be explained by a known biologic pathway or mechanism, the association is said to have biologic plausibility (Choice A). If biologic

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include biologic plausibility, dose-response relationship, specificity and strength of association, and temporal relationship between exposure to one variable and development of the second variable. In this example, the two variables being studied are cardiovascular disease and cigarette smoking. The positive correlation found between increased risk for cardiovascular disease and number of cigarettes smoked daily indicates that as the number of cigarettes smoked daily increased, so does the risk for cardiovascular disease. This is an example of a dose-response relationship. The number of cigarettes smoked daily is considered the dose, and risk for cardiovascular disease is considered the response. The positive correlation between the two is more suggestive of causation than if the risk for cardiovascular disease were the same no matter what number of cigarettes were smoked daily. Thus, the presence of a dose-response relationship in this study is one criterion for causality.

Incorrect Answers: A, C, D, and E.

If an observed association can be explained by a known biologic pathway or mechanism, the association is said to have biologic plausibility (Choice A). If biologic plausibility is present, then there is an increased likelihood that an observed association may reflect causation. In this example, increased risk for cardiovascular disease with increased number of cigarettes smoked daily represents a dose-response relationship.

Specificity of the association (Choice C) occurs when there is a one-to-one relationship between the exposure and the outcome. It implies that the risk factor is the cause of one disease. In this study, cigarette smoking is associated with cardiovascular disease, but no information is provided about the association of cigarette smoking and other diseases, so the specificity of the association cannot be determined.

Strength of the association (Choice D) increases likelihood that correlation represents causation. An association between two variables can be conveyed by the correlation coefficient r. An r value of 0 indicates no correlation while an r value of 1 indicates a perfectly positive correlation. As r approaches 1, the strength of the association increases, and the correlation is more likely to be causative. In this example, the r value is not known, so the strength of the association cannot be determined.

Temporal relationship (Choice E) exists if the exposure is known to precede the outcome. In this case, we do not know whether patients in the studies developed cardiovascular disease prior to, during, or after the use of cigarettes. If patients were known to have no cardiovascular disease prior to use of cigarettes and then developed one after use of cigarettes, such would qualify as a temporal relationship.

Educational Objective: A correlation between two variables is more likely to represent causation when there is increased strength of the association, specificity of the association, a dose-response relationship, a temporal relationship, the relationship is identified consistently in multiple studies, and there is biologic plausibility. However, true causality cannot be determined by an observational study.

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10. A 23-year-old woman comes to the physician to learn the results of a PPD skin test performed 48 hours ago. The test is required before she begins her first year of nursing school. She feels well. She emigrated from Thailand at the age of 15 years. She received the bCG vaccine during infancy. She has no history of serious illness and takes no medications. She has no known exposure to anyone with tuberculosis or respiratory symptoms. She does not drink alcohol. Vital signs are within normal limits. Examination shows no abnormalities. The PPD skin test shows 15 mm of induration. An x-ray of the chest shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Isoniazid therapy
B) Repeat PPD skin test in 2 weeks
C) Rifampin, pyrazinamide, and ethambutol therapy
D) Sputum cultures for acid-fast bacilli
E) No further management is indicated

Correct Answer: A.

Isoniazid therapy is the most appropriate next step in management of this patient with 15 mm of induration on her PPD skin test. Latent tuberculosis infection (LTBI) is defined as a positive PPD skin test or interferon gamma release assay (IGRA) in the absence of active pulmonary or disseminated infection with *Mycobacterium tuberculosis* (MTB). Risk factors for exposure to MTB include residence in a region of the world where it is endemic, employment as a healthcare worker, or residence in prisons or homeless shelters. The PPD skin test is considered positive at varying sizes of induration based on the population in which the test is done. While patients with HIV and other conditions that cause immunosuppression are considered to have a positive PPD skin test if the induration is measured at or above 5 mm, the general population is considered to have a positive test if the induration is 15 mm or greater. Health care workers or those who work with high-risk populations are often considered to have positive results warranting treatment at 10 mm of induration. While the bCG can cause a false-positive PPD reaction, the effect usually wanes within 5 years of vaccination, so this patient's induration should not be attributed to prior vaccination status. Active infection should be excluded with chest x-ray prior to initiating therapy for LTBI. Treatment regimens vary, but a common regimen consists of 9 months of isoniazid therapy.

Incorrect Answers: B, C, D, and E.

Repeat PPD skin test in 2 weeks (Choice B) is unnecessary and would delay treatment. This patient has a positive test right now and should be treated for LTBI prior

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Correct Answer: A.

Isoniazid therapy is the most appropriate next step in management of this patient with 15 mm of induration on her PPD skin test. Latent tuberculosis infection (LTBI) is defined as a positive PPD skin test or interferon gamma release assay (IGRA) in the absence of active pulmonary or disseminated infection with *Mycobacterium tuberculosis* (MTB). Risk factors for exposure to MTB include residence in a region of the world where it is endemic, employment as a healthcare worker, or residence in prisons or homeless shelters. The PPD skin test is considered positive at varying sizes of induration based on the population in which the test is done. While patients with HIV and other conditions that cause immunosuppression are considered to have a positive PPD skin test if the induration is measured at or above 5 mm, the general population is considered to have a positive test if the induration is 15 mm or greater. Health care workers or those who work with high-risk populations are often considered to have positive results warranting treatment at 10 mm of induration. While the bCG can cause a false-positive PPD reaction, the effect usually wanes within 5 years of vaccination, so this patient's induration should not be attributed to prior vaccination status. Active infection should be excluded with chest x-ray prior to initiating therapy for LTBI. Treatment regimens vary, but a common regimen consists of 9 months of isoniazid therapy.

Incorrect Answers: B, C, D, and E.

Repeat PPD skin test in 2 weeks (Choice B) is unnecessary and would delay treatment. This patient has a positive test right now and should be treated for LTBI given absent signs of active disease.

Rifampin, pyrazinamide, and ethambutol therapy (Choice C) is an appropriate treatment regimen for patients with pulmonary tuberculosis, which usually presents with systemic symptoms and cavitary lesions on chest x-ray. This patient has LTBI and does not require treatment for active MTB infection.

Sputum cultures for acid-fast bacilli (Choice D) are indicated for patients who are thought to have pulmonary tuberculosis. Sputum cultures are used to confirm or rule out the diagnosis and are performed using early morning sputum samples.

No further management is indicated (Choice E) is incorrect. This patient has evidence of LTBI and should be treated accordingly.

Educational Objective: Most patients are considered to have a positive PPD skin test if there is evidence of induration measuring at least 15 mm after 48 hours. In these instances, active MTB infection should be ruled out by clinical history, physical exam, and chest x-ray. Patients diagnosed with LTBI should then be treated with an appropriate regimen such as isoniazid for 9 months. Patients who received the bCG vaccine in childhood should also be treated as immunity wanes after about 5 years.

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11. A 76-year-old woman is brought to the emergency department because of a 2-day history of severe, right-sided chest pain that increases with deep inspiration and coughing. She also has a 1-week history of intermittent fever, malaise, and loss of appetite. Ten days ago, she was diagnosed with pneumonia of the right lower lobe. Azithromycin therapy was begun at that time. She has no other history of serious illness and takes no other medications. On arrival, her temperature is 39.5°C (103.1°F), pulse is 92/min, and blood pressure is 120/75 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. On pulmonary examination, there is egophony and dullness to percussion over the right lower lobe. Breath sounds are decreased on the right. A chest x-ray shows a right pleural effusion. Thoracentesis is performed; pleural fluid analysis shows a leukocyte count of 16,000/mm^3, glucose concentration of 50 mg/dL, and pH of 7.12. Which of the following is the most appropriate next step in management?

A) CT scan of the chest
B) Intravenous furosemide therapy
C) Intubation and mechanical ventilation
D) Placement of a chest tube
E) Pleurodesis of the right pleural space

Correct Answer: D.

Placement of a chest tube for the treatment of empyema is the most appropriate next step in management of this patient. This patient initially presented with evidence of community-acquired pneumonia and was treated with macrolide monotherapy, but she subsequently developed a parapneumonic effusion. In some cases, a parapneumonic effusion may develop into an empyema, which is defined by bacterial infection of the pleural space. The diagnosis of empyema usually requires thoracentesis to sample the pleural fluid. Fluid that has frank pus, an increased leukocyte count, a Gram stain showing bacterial organisms, a glucose concentration less than 40 mg/dL, or a pH of less than 7.2 all supports the diagnosis of empyema. Treatment with antibiotics alone results in clinical failure in almost all cases, so recommended therapy involves the insertion of a chest tube. Traditionally these have been large bore chest tubes, although some physicians will insert smaller chest tubes to improve patient comfort. The infusion of tissue plasminogen activator and recombinant deoxyribonuclease (DNase) into the pleural space through the chest tube in combination with intravenous antibiotic therapy targeting the implicated organism results in resolution of empyema in most cases. For patients in whom chest tube insertion fails to resolve the infection, video-assisted thoracoscopic surgery for decortication and drainage are typically required.

Incorrect Answers: A, B, C, and E

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E) Pleurodesis of the right pleural space

Correct Answer: D.

Placement of a chest tube for the treatment of empyema is the most appropriate next step in management of this patient. This patient initially presented with evidence of community-acquired pneumonia and was treated with macrolide monotherapy, but she subsequently developed a parapneumonic effusion. In some cases, a parapneumonic effusion may develop into an empyema, which is defined by bacterial infection of the pleural space. The diagnosis of empyema usually requires thoracentesis to sample the pleural fluid. Fluid that has frank pus, an increased leukocyte count, a Gram stain showing bacterial organisms, a glucose concentration less than 40 mg/dL, or a pH of less than 7.2 all supports the diagnosis of empyema. Treatment with antibiotics alone results in clinical failure in almost all cases, so recommended therapy involves the insertion of a chest tube. Traditionally these have been large bore chest tubes, although some physicians will insert smaller chest tubes to improve patient comfort. The infusion of tissue plasminogen activator and recombinant deoxyribonuclease (DNase) into the pleural space through the chest tube in combination with intravenous antibiotic therapy targeting the implicated organism results in resolution of empyema in most cases. For patients in whom chest tube insertion fails to resolve the infection, video-assisted thoracoscopic surgery for decortication and drainage are typically required.

Incorrect Answers: A, B, C, and E.

CT scan of the chest (Choice A) is not required to make the diagnosis of empyema and would only delay the necessary insertion of a chest tube.

Intravenous furosemide therapy (Choice B) is an appropriate intervention for patients with hypervolemia and pulmonary edema secondary to decompensated heart failure. This patient's lung findings are consistent with empyema, not with pulmonary edema.

Intubation and mechanical ventilation (Choice C) is indicated for patients with acute hypoxemic or hypercapnic respiratory failure, or for those unable to protect their airway. This patient is not in respiratory distress and remains alert. She does not require intubation.

Pleurodesis of the right pleural space (Choice E) is indicated for patients with recurrent malignant pleural effusions or for patients with recurrent pneumothoraces.

Educational Objective: An empyema is a bacterial infection of the pleural space that may develop as a complication of bacterial pneumonia. Diagnosis is made by examination of the pleural fluid, which commonly demonstrates increased leukocytes, a pH less than 7.2, a decreased glucose concentration, and/or a Gram stain showing bacterial organisms. Treatment is with placement of a chest tube for drainage and intravenous antibiotics.

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12. A 45-year-old woman with type 2 diabetes mellitus comes to the physician because of a 6-month history of mild pain and swelling of her right hand; the pain radiates to her shoulder. During this time, she also has had episodes of numbness and tingling of her right thumb and index and ring fingers, especially after prolonged typing. She has not sustained any recent injury. She is right-hand dominant. Her medications are insulin and ibuprofen. Vital signs are within normal limits. The neck is nontender, and range of motion is full. Spurling test is negative. Muscle strength is 5/5 in the supraspinatus, infraspinatus, and subscapularis. Radial pulses are 2+ bilaterally. Motor and sensory testing of the radial, median, and ulnar nerves shows no abnormalities. There is no thenar atrophy. Phalen test is positive on the right and negative on the left. Impingement testing is negative. Which of the following is the most appropriate next step in management?

A) MRI of the right shoulder
B) Oral hydrocodone therapy
C) Physical therapy
D) Triamcinolone injection therapy
E) Use of a computer keyboard with a wrist pad

Correct Answer: E.

Use of a computer keyboard with a wrist pad is the most appropriate next step in management of this patient with mild carpal tunnel syndrome. Carpal tunnel syndrome results from compression of the median nerve within the carpal tunnel and presents with signs and symptoms including pain, weakness, and paresthesia of the first three digits, and positive provocative test maneuvers such as the Tinel or Phalen tests. Patients with mild symptoms can be treated conservatively with wrist splinting and ergonomic changes, including the use of wrist support devices for patients who use the computer frequently. If wrist splints are used, they are typically worn at night but may also be used during the day. Splinting reduces the range of motion of the wrist and limits activities that increase pressure within the carpal tunnel. Patients who have persistent or severe symptoms, or muscular weakness may require surgical decompression.

Incorrect Answers: A, B, C, and D.

MRI of the right shoulder (Choice A) is unlikely to provide any meaningful diagnostic information. This patient's shoulder examination is normal, and her neurologic complaints localize to the carpal tunnel, not to the shoulder.

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D) Triamcinolone injection therapy

E) Use of a computer keyboard with a wrist pad

Correct Answer: E.

Use of a computer keyboard with a wrist pad is the most appropriate next step in management of this patient with mild carpal tunnel syndrome. Carpal tunnel syndrome results from compression of the median nerve within the carpal tunnel and presents with signs and symptoms including pain, weakness, and paresthesia of the first three digits, and positive provocative test maneuvers such as the Tinel or Phalen tests. Patients with mild symptoms can be treated conservatively with wrist splinting and ergonomic changes, including the use of wrist support devices for patients who use the computer frequently. If wrist splints are used, they are typically worn at night but may also be used during the day. Splinting reduces the range of motion of the wrist and limits activities that increase pressure within the carpal tunnel. Patients who have persistent or severe symptoms, or muscular weakness may require surgical decompression.

Incorrect Answers: A, B, C, and D.

MRI of the right shoulder (Choice A) is unlikely to provide any meaningful diagnostic information. This patient's shoulder examination is normal, and her neurologic complaints localize to the carpal tunnel, not to the shoulder.

Oral hydrocodone therapy (Choice B) is unnecessary for this patient with carpal tunnel syndrome. Opiates are potentially addictive and generally ineffective for this indication.

Physical therapy (Choice C) will not treat the underlying compression of the median nerve. More appropriate interventions include ergonomic changes at work and the use of wrist splinting if necessary.

Triamcinolone injection therapy (Choice D) is not indicated for the treatment of carpal tunnel syndrome. For patients with refractory symptoms, surgery to decompress the carpal tunnel is indicated.

Educational Objective: Carpal tunnel syndrome results from compression of the median nerve within the carpal tunnel and presents with signs and symptoms including pain, weakness, and paresthesia of the first three digits, and positive provocative test maneuvers such as the Tinel or Phalen tests. The initial management for patients with mild symptoms includes ergonomic changes to relieve compression or the use of wrist splints.

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13. A 70-year-old woman is admitted to the hospital because of a 1-hour history of severe right-sided chest pain, shortness of breath, and dizziness. During this time, she also has had several coughing episodes, one of which produced blood-tinged sputum. Eighteen hours ago, she returned home from a cross-country airplane trip to see her daughter and grandchildren. The patient has no history of serious illness and takes no medications. She does not smoke cigarettes or drink alcohol. She follows a vegetarian diet, is physically fit, and exercises daily. She appears anxious. She is 163 cm (5 ft 4 in) tall and weighs 45 kg (100 lb); BMI is 17 kg/m^2. Her pulse is 98/min, respirations are 16/min, and blood pressure is 106/84 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Examination shows jugular venous distention. Breath sounds are normal. On cardiac examination, S_2 is increased; no murmurs are heard. Examination of the left calf shows tenderness to palpation and a positive Homans sign. Which of the following is the strongest predisposing risk factor for this patient's in-hospital mortality?

A) Age
B) Blood pressure
C) Hemoptysis
D) Lower extremity examination findings
E) Weight

Correct Answer: A.

Advanced age is the strongest predisposing risk factor for in-hospital mortality for this patient with signs and symptoms of a deep vein thrombosis (DVT) and pulmonary embolism (PE). PE can be diagnosed definitively with the use of a CT scan with intravenous contrast that is timed to opacify the pulmonary arteries. Pulmonary emboli are seen as filling defects within the pulmonary arteries. Risk factors for the development of a PE include the presence of a DVT, which is suggested in this patient with left calf tenderness and a positive Homans sign. DVTs are more likely to occur in patients who are obese, women who smoke and take hormonal birth control pills, patients with underlying medical conditions that predispose to clot formation, those who have recently undergone surgery, and patients who have been confined to airplanes or cars for an extended period of time. Treatment of DVT or PE is with the use of systemic anticoagulants. Risk factors for in-hospital mortality include the presence of obstructive shock and advanced age. This patient is not in shock but is elderly.

Incorrect Answers: B, C, D, and E.

Blood pressure (Choice B) is not the correct answer. While this patient's blood pressure is relatively low, she doesn't exhibit signs or symptoms of obstructive shock, which

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D) Lower extremity examination findings

E) Weight

Correct Answer: A.

Advanced age is the strongest predisposing risk factor for in-hospital mortality for this patient with signs and symptoms of a deep vein thrombosis (DVT) and pulmonary embolism (PE). PE can be diagnosed definitively with the use of a CT scan with intravenous contrast that is timed to opacify the pulmonary arteries. Pulmonary emboli are seen as filling defects within the pulmonary arteries. Risk factors for the development of a PE include the presence of a DVT, which is suggested in this patient with left calf tenderness and a positive Homans sign. DVTs are more likely to occur in patients who are obese, women who smoke and take hormonal birth control pills, patients with underlying medical conditions that predispose to clot formation, those who have recently undergone surgery, and patients who have been confined to airplanes or cars for an extended period of time. Treatment of DVT or PE is with the use of systemic anticoagulants. Risk factors for in-hospital mortality include the presence of obstructive shock and advanced age. This patient is not in shock but is elderly.

Incorrect Answers: B, C, D, and E.

Blood pressure (Choice B) is not the correct answer. While this patient's blood pressure is relatively low, she doesn't exhibit signs suggestive of obstructive shock, which increases mortality substantially.

Hemoptysis (Choice C) may be suggestive of PE, but it does not necessarily correlate with the severity of the patient's illness. Additionally, her hemoptysis is scant, not massive, so it is unlikely to affect the patency of her airway or contribute substantially to blood loss.

Lower extremity examination findings (Choice D), including a positive Homans sign and calf tenderness, help to make the diagnosis of DVT but are not prognostic indicators.

Weight (Choice E) in excess may predispose the patient to DVT because of venous stasis and relative immobility, however, is not as strong of a prognostic indicator as age. In this case, the patient's BMI is low, which may be a positive prognostic indicator.

Educational Objective: DVTs from the lower extremities may embolize and lead to PE, which commonly presents with chest pain, tachycardia, and hypoxemia. Risk factors for in-hospital mortality include the presence of shock and older age.

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14. A 3-year-old boy is brought to the physician for a well-child examination. He is at the 50th percentile for height, weight, and head circumference. His appetite is good. His pulse is 85/min. His blood pressure is 140/75 mm Hg and 140/78 mm Hg in the right and left upper extremities, respectively. His blood pressure is 144/76 mm Hg and 145/79 mm Hg in the right and left lower extremities, respectively. Funduscopic, cardiopulmonary, and abdominal examinations show no other abnormalities. Results of a complete blood count; serum electrolyte, urea nitrogen, and creatinine concentrations; and urinalysis are within the reference ranges. Which of the following is the most appropriate next step in diagnosis?

A) Intravenous pyelography
B) Measurement of serum B-type natriuretic peptide
C) Polysomnography
D) Renal Doppler ultrasonography
E) Thyroid function tests

Correct Answer: D.

Renal Doppler ultrasonography is the next most appropriate step in evaluation of this pediatric patient with hypertension. Secondary hypertension refers to increased blood pressure that is a result of another underlying medical condition. Some underlying causes include renal artery stenosis (also known as renovascular hypertension), renal parenchymal diseases such as glomerulonephritis, Cushing disease or syndrome, pheochromocytoma, and primary or familial hyperaldosteronism, among others. Adult patients who are on three or more blood pressure medications, including a diuretic, and still have hypertension should be evaluated for secondary hypertension, while pediatric patients with hypertension should always be evaluated for underlying causes. While primary hypertension is more common in school-age children who are overweight or obese, it is less common is very young patients. Typical tests used for the initial evaluation of secondary hypertension include measurement of serum renin and aldosterone, serum and urine metanephrines, and renal ultrasonography with doppler to assess the patency of the renal arteries and evaluate the renal parenchyma. Renal artery stenosis can be diagnosed based on assessment of the velocity of blood flow through the renal arteries. Treatment may include renal artery stenting.

Incorrect Answers: A, B, C, and E.

Intravenous pyelography (Choice A) is used to evaluate the anatomy of the renal collecting system, including the calyces and the ureters. It is not frequently used anymore

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E) Thyroid function tests

Correct Answer: D.

Renal Doppler ultrasonography is the next most appropriate step in evaluation of this pediatric patient with hypertension. Secondary hypertension refers to increased blood pressure that is a result of another underlying medical condition. Some underlying causes include renal artery stenosis (also known as renovascular hypertension), renal parenchymal diseases such as glomerulonephritis, Cushing disease or syndrome, pheochromocytoma, and primary or familial hyperaldosteronism, among others. Adult patients who are on three or more blood pressure medications, including a diuretic, and still have hypertension should be evaluated for secondary hypertension, while pediatric patients with hypertension should always be evaluated for underlying causes. While primary hypertension is more common in school-age children who are overweight or obese, it is less common is very young patients. Typical tests used for the initial evaluation of secondary hypertension include measurement of serum renin and aldosterone, serum and urine metanephrines, and renal ultrasonography with doppler to assess the patency of the renal arteries and evaluate the renal parenchyma. Renal artery stenosis can be diagnosed based on assessment of the velocity of blood flow through the renal arteries. Treatment may include renal artery stenting.

Incorrect Answers: A, B, C, and E.

Intravenous pyelography (Choice A) is used to evaluate the anatomy of the renal collecting system, including the calyces and the ureters. It is not frequently used anymore as it has largely been supplanted by the use of CT scans and ultrasonography.

Measurement of serum B-type natriuretic peptide (Choice B) is frequently increased in patients with acute decompensated heart failure. This patient lacks other features typical of heart failure.

Polysomnography (Choice C) is used to diagnose obstructive sleep apnea (OSA), which, when untreated, may exacerbate hypertension. OSA frequently presents with daytime somnolence and morning headaches and is not common in pediatric patients outside of tonsillar hypertrophy or congenital oropharyngeal structural anomalies.

Thyroid function tests (Choice E) are used to diagnose hyperthyroidism or hypothyroidism. Hypertension is more common in hypothyroidism, but this patient lacks other features including goiter, fatigue, weight gain, and cold intolerance.

Educational Objective: Renovascular hypertension is one cause of secondary hypertension in pediatric patients and is diagnosed using renal ultrasonography with Doppler to assess the velocity of blood flow through the renal arteries. Treatment may include renal artery stenting.

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15. A 57-year-old woman is brought to the emergency department by paramedics 15 minutes after she was found unresponsive on a park bench. She was examined in the same emergency department 2 weeks ago because of a 2-month history of episodic unilateral throbbing headaches that typically occurred on the right side of the head but intermittently occurred on the left. Examination at that time showed no abnormalities. She was diagnosed with migraine, received an intramuscular injection of ketorolac, and discharged with instructions to schedule a follow-up examination with her primary care physician. Review of her medical records from that examination shows a 6-month history of chronic back pain, 15-year history of hypertension and type 2 diabetes mellitus, and 40-year history of post-traumatic complex partial seizures. Her other medications are oxycodone, lisinopril, metformin, and carbamazepine. On arrival, she is obtunded. Her pulse is 78/min, respirations are 6/min, and blood pressure is 160/92 mm Hg. On examination, the pupils are 1 mm and minimally reactive to light. There are intermittent, symmetrical, semipurposeful movements of all extremities. Deep tendon reflexes are 1+. Babinski sign is absent bilaterally. On ice-water caloric testing, the eyes move toward the ear in which the water is placed. Which of the following is the most likely cause of this patient's decreased level of consciousness?

A) Chronic subdural hematoma
B) Conversion disorder
C) Hypertensive encephalopathy
D) Hypoglycemia
E) Opioid intoxication
F) Ruptured saccular aneurysm
G) Status epilepticus

Correct Answer: E.

This patient is intoxicated with opioids, which are central nervous system (CNS) depressants used as analgesics and recreational drugs. Opioids act throughout the CNS and peripheral nervous system, and interact with several neurotransmitter systems, leading to diverse effects. Opioid intoxication causes euphoria (because of interaction with dopamine), altered mental status, sedation (in severe cases manifesting as a decreased Glasgow Coma Scale score as evidenced by this patient's decreased purposeful movements), bradycardia, hypotension, depressed respiratory drive, and miosis. Miosis is a distinctive finding that is less common in other neurologic conditions and is caused by direct opioid receptor activity in brain areas responsible for pupillary control. Opioids also act on receptors within the enteric nervous system, reducing gut motility and thus causing constipation. This patient's ketorolac treatment may have led to decreased kidney function and consequent increases in serum

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D) Hypoglycemia

E) Opioid intoxication

F) Ruptured saccular aneurysm

G) Status epilepticus

Correct Answer: E.

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Incorrect Answers: A, B, C, D, F, and G.

Chronic subdural hematoma (Choice A) refers to the gradual accumulation of blood between the dura and arachnoid membranes that commonly occurs in elderly patients. It typically presents with headache and cognitive impairment along with ipsilateral or contralateral focal neurologic deficits typically localized to the cerebral cortex or midbrain. This patient is not elderly and does not demonstrate focal neurologic deficits.

Conversion disorder (Choice B), a functional neurologic disorder, involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. This patient's objective findings (eg, bradypnea, miosis) are consistent with opioid intoxication.

Hypertensive encephalopathy (Choice C) may result from acute and/or severe increases in blood pressure (eg, greater than 180/120). It potentially manifests with headache, vomiting, agitation, altered mental status, and/or seizure, and may progress to obtundation and coma. This patient's hypertension is relatively mild, and miosis and bradypnea would be atypical of hypertensive encephalopathy.

Hypoglycemia (Choice D) may manifest with sympathoadrenal symptoms (eg, tremors, palpitations, diaphoresis, mild hypertension, mild tachycardia) along with cognitive impairment. Tachypnea is more common than bradypnea. As well, miosis would be atypical.

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Incorrect Answers: A, B, C, D, F, and G.

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Conversion disorder (Choice B), a functional neurologic disorder, involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. This patient's objective findings (eg, bradypnea, miosis) are consistent with opioid intoxication.

Hypertensive encephalopathy (Choice C) may result from acute and/or severe increases in blood pressure (eg, greater than 180/120). It potentially manifests with headache, vomiting, agitation, altered mental status, and/or seizure, and may progress to obtundation and coma. This patient's hypertension is relatively mild, and miosis and bradypnea would be atypical of hypertensive encephalopathy.

Hypoglycemia (Choice D) may manifest with sympathoadrenal symptoms (eg, tremors, palpitations, diaphoresis, mild hypertension, mild tachycardia) along with cognitive impairment. Tachypnea is more common than bradypnea. As well, miosis would be atypical.

A ruptured saccular aneurysm (Choice F) leads to subarachnoid hemorrhage, which presents with severe headache of precipitous onset, nausea, vomiting, meningismus, coma, and potentially death. Obtundation and miosis are more consistent with opioid intoxication.

Status epilepticus (Choice G) is defined as continuous epileptic activity for at least 5 minutes or at least two discrete seizures with incomplete interval recovery of consciousness. Status epilepticus may present with persistent motor behavior (if convulsive) or decreased consciousness (if nonconvulsive). Bradypnea and miosis are more consistent with opioid intoxication.

Educational Objective: Opioid intoxication causes symptoms of CNS depression including sedation, respiratory depression, bradycardia, and hypotension. Miosis differentiates opioid intoxication from other neurologic conditions.

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16. A 51-year-old man, hospitalized for management of a proximal jejunal enterocutaneous fistula, has a 2-day history of fever and malaise. Four weeks ago, he underwent laparotomy for a gunshot wound to the abdomen; the fistula was noted 1 week after the operation. Since undergoing the laparotomy, he has received total parenteral nutrition through a left subclavian central catheter. During the past 2 weeks, he has participated in physical therapy; until today, he was able to ambulate 300 ft and walk up two flights of stairs without shortness of breath. He has no other history of serious illness. His medications are somatostatin and morphine. His temperature is 38.4°C (101.1°F), pulse is 105/min, respirations are 20/min, and blood pressure is 110/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 96%. Examination shows the fistula opening with draining enteric contents. An ostomy pouching system is placed, and the surrounding skin is well protected. Fistula output is 400 mL daily. Three days ago, his leukocyte count was 8000/mm^3; today, it is 14,000/mm^3. Serum studies today show an albumin concentration of 2.7 g/dL and prealbumin concentration of 19 mg/dL (N=19.5–35.8). Which of the following is the most appropriate next step in management?

A) Blood cultures from the catheter site
B) Chest x-ray
C) CT scan of the abdomen
D) Exploratory laparotomy and resection of the fistula
E) Intravenous antifungal therapy

Correct Answer: A.

Blood cultures from the catheter site is the most appropriate next step in management of this patient on total parenteral nutrition (TPN) through a central line and new onset fever and leukocytosis. The presence of a long-term intravenous catheter substantially increases the risk for bacteremia leading to sepsis, which is known as a catheter-associated blood stream infection (CLABSI). Additionally, fungemia should also be suspected in patients who have recently undergone abdominal surgeries and are on TPN, but this is less common than bacteremia. All patients who are being evaluated for sepsis should have anaerobic and aerobic blood cultures drawn from two different sites. In patients with a central venous catheter, at least one of these sets should be obtained from the central line. Removal of the central venous catheter is recommended in almost all circumstances, although there are some rare instances in which patients may receive treatment for bloodstream infections while their central line remains in place. Following blood cultures, empiric antibiotics should be started.

Incorrect Answers: B, C, D, and E.

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A) Blood cultures from the catheter site
B) Chest x-ray
C) CT scan of the abdomen
D) Exploratory laparotomy and resection of the fistula
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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Chest x-ray (Choice B) is typically a standard part of the workup for all patients with sepsis, but the presence of a central venous catheter should raise suspicion for CLABSI, so blood cultures should be obtained first.

CT scan of the abdomen (Choice C) might be considered if this patient were to develop worsening abdominal pain and were suspected of having a new intra-abdominal infection, but his abdominal examination is benign.

Exploratory laparotomy and resection of the fistula (Choice D) would only be indicated if there was evidence of peritonitis on examination, but this patient's abdominal examination has not changed significantly.

Intravenous antifungal therapy (Choice E) should be considered if this patient has persistent fevers despite the initiation of broad-spectrum antibiotics, or if fungal elements are identified in his blood cultures. Patients on TPN are at a higher risk for invasive fungal infections than the general population.

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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Chest x-ray (Choice B) is typically a standard part of the workup for all patients with sepsis, but the presence of a central venous catheter should raise suspicion for CLABSI, so blood cultures should be obtained first.

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Intravenous antifungal therapy (Choice E) should be considered if this patient has persistent fevers despite the initiation of broad-spectrum antibiotics, or if fungal elements are identified in his blood cultures. Patients on TPN are at a higher risk for invasive fungal infections than the general population.

Educational Objective: Catheter-related bloodstream infections should be suspected in patients who have central venous catheters and develop fevers and leukocytosis without obvious localizing signs to suggest an alternative site of infection. The longer that a central venous catheter remains in place, the higher the risk for infection. Evaluation includes blood cultures obtained from the central line and an alternative site. Most patients should be started on broad-spectrum intravenous antibiotics and should have their central line removed.

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17. A study is conducted to investigate the attitude of patients with type 2 diabetes mellitus toward controlling their disease with lifestyle modifications, including diet and exercise. A total of 20 men and women aged 55 to 70 years are randomly selected from an outpatient diabetes clinic and are enrolled in the study. The male-to-female ratio among the patients is 1:1, and they are matched by age and BMI. Patients are assigned to groups led by a moderator who uses a standard set of scenarios to prompt discussion. The discussions are video recorded and reviewed to examine the patterns of the patients' attitudes toward lifestyle modification in order to improve control of their disease. Which of the following best describes this study design?

A) Case report
B) Case series
C) Matched case-control
D) Qualitative
E) Randomized trial

Correct Answer: D.

Qualitative studies are used to study social or other less quantifiable phenomena. How individuals think about their disease, barriers to pursuing treatment, or the social stigma experienced by patients are examples of social phenomena that may be studied qualitatively. In a qualitative study, the researcher is the primary tool used for data collection. In this case, focus group discussions of patients with type 2 diabetes mellitus are conducted by a moderator and then reviewed for emerging themes surrounding patients' attitudes toward lifestyle modification. Qualitative data rather than numerical data is collected. As is the case for quantitative studies, there are many approaches to qualitative studies. In this case, a phenomenology approach is taken in which a phenomenon is explored through hearing the perspectives of those experiencing it. A phenomenology-based qualitative study often includes interviews of individuals or focus group discussions. Qualitative studies may generate hypotheses or interventions which may then be tested quantitatively. For example, if these focus group discussions reveal that most patients feel they do not know where to start with lifestyle modifications, an educational module could be developed and then tested among a larger group of patients with type 2 diabetes mellitus to determine whether increased education would lead to greater rates of lifestyle modification.

Incorrect Answers: A, B, C, and E.

A case report (Choice A) describes the disease course and outcome of a single patient. A case series study (Choice B) is a descriptive study that describes the history

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Qualitative studies are used to study social or other less quantifiable phenomena. How individuals think about their disease, barriers to pursuing treatment, or the social stigma experienced by patients are examples of social phenomena that may be studied qualitatively. In a qualitative study, the researcher is the primary tool used for data collection. In this case, focus group discussions of patients with type 2 diabetes mellitus are conducted by a moderator and then reviewed for emerging themes surrounding patients' attitudes toward lifestyle modification. Qualitative data rather than numerical data is collected. As is the case for quantitative studies, there are many approaches to qualitative studies. In this case, a phenomenology approach is taken in which a phenomenon is explored through hearing the perspectives of those experiencing it. A phenomenology-based qualitative study often includes interviews of individuals or focus group discussions. Qualitative studies may generate hypotheses or interventions which may then be tested quantitatively. For example, if these focus group discussions reveal that most patients feel they do not know where to start with lifestyle modifications, an educational module could be developed and then tested among a larger group of patients with type 2 diabetes mellitus to determine whether increased education would lead to greater rates of lifestyle modification.

Incorrect Answers: A, B, C, and E.

A case report (Choice A) describes the disease course and outcome of a single patient. A case series study (Choice B) is a descriptive study that describes the history, possible exposures, and clinical findings of a group of patients with a similar diagnosis. Neither case reports nor case series are analytic studies. They do not test a hypothesis.

Matched case-control (Choice C) studies compare one group of patients with an outcome under study (cases) against a second matched group without that outcome (controls) and identifies the associated exposure within each group. Case-control studies can be conducted in a prospective or retrospective manner but are always observational studies.

A randomized trial (Choice E) is a type of prospective, interventional study design wherein patients are randomly assigned to receive a particular intervention. The intervention may be compared against placebo therapy or against standard therapy, depending on the study design and the disease or treatment being studied. When combined with blinding procedures, randomized control studies form the gold standard of medical research and generate more powerful evidence than other forms of observational or descriptive studies.

Educational Objective: Qualitative studies are used to study social or other phenomena such as how individuals think about their disease, barriers to pursuing treatment, or the social stigma experienced by patients. Focus groups and interviews are often features of qualitative studies.

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18. A 42-year-old man is brought to the emergency department by ambulance 20 minutes after sustaining a stab wound to his right anterior chest. On arrival, the patient is uncooperative, refusing to lie flat on the gurney. Medical history is unremarkable, and he takes no medications. He says he drank six 12-oz beers and used cocaine today. Vital signs are pulse 130/min, respirations 28/min, and blood pressure 66/40 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. The patient appears anxious. Physical examination discloses a single stab wound in the medial right anterior chest, 3 cm below the right nipple. The trachea is midline. Breath sounds are present bilaterally. Cardiac examination discloses distant but normal S_1 and S_2. Abdominal examination discloses no abnormalities. Which of the following is the most appropriate next step in management?

A) Chest x-ray
B) CT scan of the chest
C) Endotracheal intubation
D) Focused assessment with sonography for trauma (FAST)
E) Placement of a right chest tube

Correct Answer: D.

Bedside ultrasonography is the most appropriate next step in diagnosis. This patient has a history of penetrating chest trauma and now presents with tachycardia, hypotension, and distant heart sounds. Together, this is concerning for pericardial tamponade. Further assessment using bedside ultrasonography should be the next step in diagnosis. Characteristic findings on echocardiography include a pericardial effusion, collapse of the right atrium at the end of diastole, and collapse of the right ventricle in the early part of diastole, representing impairment of right ventricular diastolic filling. This leads to decreased preload and cardiac output, resulting in hypotension and jugular venous distension. Emergent pericardiocentesis or pericardial window must be done to resolve cardiac tamponade. A focused assessment with sonography for trauma (FAST) is a rapid diagnostic test that is helpful in the diagnosis and management of a hypotensive patient with traumatic injuries because it can evaluate for cardiac tamponade, pneumothorax, hemothorax, or hemoperitoneum. This patient should also receive large bore intravenous access and immediate resuscitation with crystalloid followed by blood products prior to performing any diagnostic test because of his degree of hemodynamic instability.

Incorrect Answers: A, B, C, and E.

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Incorrect Answers: A, B, C, and E.

A chest x-ray (Choice A) is an important part of the trauma survey and can evaluate for rib fractures, pneumothorax, hemothorax, or widened mediastinum in great vessel injury. Similarly, CT scan of the chest (Choice B) is able to evaluate lung parenchyma and is more sensitive for rib fractures. A chest x-ray would not be able to identify pericardial effusion or acute cardiac tamponade but may show an enlarged or misshapen cardiac silhouette in such cases. While a CT scan of the chest can identify a pericardial effusion, this patient is hemodynamically unstable and unable to lay flat for a CT scan at this time; ultrasonography is a rapid diagnostic test that can be done at the bedside.

Endotracheal intubation (Choice C) may be emergently indicated in an uncooperative patient with serious traumatic injuries in order to facilitate traumatic examination and management. However, this patient is hypotensive and is at risk for cardiac arrest if intubation is attempted prior to resuscitation. The patient should be resuscitated prior to attempting endotracheal intubation, and a FAST can facilitate diagnosis and management of this patient's hypotension.

Placement of a right chest tube (Choice E) would be indicated in the setting of tension pneumothorax or massive hemothorax. Pneumothorax would present with decreased breath sounds, hyperresonance to percussion, and tracheal deviation. Hemothorax would present similarly with decreased breath sounds, but with dullness to percussion.

Educational Objective: Cardiac tamponade can result from a penetrating chest wound and presents with hypotension, distant heart sounds, and jugular venous distension. A FAST is a rapid bedside test that can be performed to evaluate for causes of hypotension and guide further management.

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19. A 37-year-old man comes to the clinic at the urging of his dentist 1 day after he was noted to have a blood pressure of 175/97 mm Hg following a dental extraction. The patient's blood pressure was normal prior to the procedure. The patient reports pain at the site of extraction but does not have headache, change in vision, chest pain, or shortness of breath. Medical history is unremarkable, and he takes no medications. His father has hypertension and sustained a myocardial infarction at age 45 years. The patient has smoked one pack of cigarettes daily for 15 years. He drinks alcoholic beverages socially but does not use illicit drugs. He is 185 cm (6 ft 1 in) tall and weighs 79 kg (175 lb); BMI is 23 kg/m^2. Blood pressure now is 133/74 mm Hg; remaining vital signs are normal. Physical examination discloses no abnormalities. Which of the following is the most appropriate next step in evaluation?

A) Determination of hemoglobin A_{1c}
B) Exercise stress testing
C) Measurement of urine microalbumin concentration
D) Serum lipid studies
E) No further evaluation is indicated

Correct Answer: D.

The presence of hypertension and a family history of coronary vascular disease at an early age are concerning for increased cardiovascular risk in this patient, and the most appropriate next step in evaluation is to investigate for the presence of additional risk factors with serum lipid studies. The United States Preventative Services Task Force (USPSTF) recommends screening for hyperlipidemia in men aged greater than 35 years and in women aged greater than 45 years who are at an increased risk for coronary vascular disease. Other risk factors for coronary vascular disease include hypertension, type 2 diabetes mellitus, a positive family history of coronary vascular disease, and smoking. Optimization of serum lipids with pharmacologic treatment and lifestyle modification can reduce the risk for coronary vascular disease and myocardial infarction. Statins remain the first-line pharmacotherapy for most patients with hyperlipidemia.

Incorrect Answers: A, B, C, and E.

Determination of hemoglobin A_{1c} (Choice A) should also be checked but is less likely to be useful in this 37-year-old patient with a low-risk BMI. If the patient had a strong family history of diabetes or a high-risk BMI, lipid studies would still be recommended as well as a hemoglobin A_{1c} concentration.

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C) Measurement of urine microalbumin concentration

D) Serum lipid studies

E) No further evaluation is indicated

Correct Answer: D.

The presence of hypertension and a family history of coronary vascular disease at an early age are concerning for increased cardiovascular risk in this patient, and the most appropriate next step in evaluation is to investigate for the presence of additional risk factors with serum lipid studies. The United States Preventative Services Task Force (USPSTF) recommends screening for hyperlipidemia in men aged greater than 35 years and in women aged greater than 45 years who are at an increased risk for coronary vascular disease. Other risk factors for coronary vascular disease include hypertension, type 2 diabetes mellitus, a positive family history of coronary vascular disease, and smoking. Optimization of serum lipids with pharmacologic treatment and lifestyle modification can reduce the risk for coronary vascular disease and myocardial infarction. Statins remain the first-line pharmacotherapy for most patients with hyperlipidemia.

Incorrect Answers: A, B, C, and E.

Determination of hemoglobin A_{1c} (Choice A) should also be checked but is less likely to be useful in this 37-year-old patient with a low-risk BMI. If the patient had a strong family history of diabetes or a high-risk BMI, lipid studies would still be recommended as well as a hemoglobin A_{1c} concentration.

Exercise stress testing (Choice B) is not indicated at this time for this young, asymptomatic patient. Stress testing is recommended for patients with angina, prior acute coronary syndrome with new or changing symptoms, or for valvular disease, cardiomyopathy, or congestive heart failure in certain settings.

Measurement of urine microalbumin concentration (Choice C) can be used to detect early stages of kidney disease. However, in the absence of persistent hypertension or additional symptoms, primary kidney disease leading to secondary hypertension is unlikely to be present in this patient.

No further evaluation is indicated (Choice E) is incorrect. There exist additional modifiable risk factors for which screening should occur at this time.

Educational Objective: Risk factors for coronary vascular disease include hypertension, type 2 diabetes mellitus, a positive family history of coronary vascular disease, and smoking. Patients who are at increased risk should be screened for additional modifiable risk factors.

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20. A 3-day-old male newborn is evaluated in the hospital nursery because of a 2-hour history of episodes of vomiting green material. He was well prior to the onset of these episodes. He was born at 41 weeks' gestation following an uncomplicated pregnancy and cesarean delivery because of failure to progress. He appears listless. He is 50 cm (19.7 in; 50th percentile) long and weighs 3628 g (8 lb; 50th percentile). His temperature is 36.7°C (98.0°F), pulse is 170/min, respirations are 50/min, and blood pressure is 70/40 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Capillary refill time is 2 seconds. The abdomen is nondistended, and the patient cries when it is palpated. The remainder of the examination discloses no abnormalities. Which of the following is most likely to establish the diagnosis?

A) Barium enema
B) Esophagogastroduodenoscopy
C) MRI of the abdomen
D) Upper gastrointestinal series
E) X-ray of the abdomen

Correct Answer: D.

Midgut volvulus, a dangerous complication of intestinal malrotation, often occurs in children within the first few months of life. Malrotation results from the incomplete rotation of the midgut during embryonal development and leaves the midgut attached to a thin stalk of mesentery at the base of the superior mesenteric artery (SMA) instead of the normally broad-based mesenteric stalk. The cecum also remains in an abnormal position within the mid-upper abdomen instead of the right lower quadrant and is attached to the lateral abdominal wall by fibrous bands, which cross over the top of the duodenum and can also cause constriction. This leaves the small intestine at risk for volvulus at the base of the SMA. Volvulus can lead to bilious vomiting, abdominal distention, and vascular compromise of the small bowel with potential consequent intestinal necrosis, hematochezia, perforation, and peritonitis. The SMA is susceptible to constriction in midgut volvulus because of its anatomical proximity and embryonal relationship to the formation of the midgut. Infants who are hemodynamically stable, as in this case (vital signs are essentially age-appropriate), may be evaluated with x-ray to confirm the diagnosis and rule out gastrointestinal perforation. Evaluation of malrotation and midgut volvulus requires an upper gastrointestinal barium series, which will outline the patient's small bowel anatomy and further assess for the presence of an obstructive volvulus. Upper gastrointestinal series are sensitive for volvulus and typically demonstrate a displaced bowel with obstruction and a corkscrew appearance. Infants in whom volvulus is confirmed or infants with suspected volvulus and unstable vital signs should undergo emergent exploratory laparoscopy.

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C) MRI of the abdomen

D) Upper gastrointestinal series

E) X-ray of the abdomen

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Barium enema (Choice A) is associated with a high rate of false positive results in the setting of suspected volvulus and should not be used.

Esophagogastroduodenoscopy (Choice B) is not typically used for the diagnosis or treatment of malrotation with volvulus. Diagnosis and repair of volvulus is more easily achieved through a laparoscopic approach.

MRI of the abdomen (Choice C) is not typically performed to detect malrotation with volvulus as it is a time-consuming study that requires sedation in infants in order to minimize motion artifacts.

X-ray of the abdomen (Choice E) is useful for confirming the presence of gastrointestinal perforation but has poor sensitivity for the detection of malrotation with volvulus.

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X-ray of the abdomen (Choice E) is useful for confirming the presence of gastrointestinal perforation but has poor sensitivity for the detection of malrotation with volvulus.

Educational Objective: Malrotation occurs secondary to the incomplete rotation of bowel during embryonic development. This places the newborn at risk for midgut volvulus, which can present with bilious vomiting, abdominal distension, and pain, and when severe, with potential intestinal necrosis, hematochezia, perforation, and peritonitis. An upper gastrointestinal series with barium is most likely to establish the diagnosis.

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21. A 66-year-old man comes to the office because of a 2-month history of right knee pain. He reports that the pain occurs for 5 to 10 minutes when he gets up in the morning, or after he walks for several blocks. He says his knee has not "given way" or "locked up." Acetaminophen has not provided relief of the pain. He reports no recent trauma to the knee but fell on it after tripping over a step 1 year ago. Medical history also is remarkable for hypertension and hyperlipidemia. Medications are lisinopril and atorvastatin. He is 173 cm (5 ft 8 in) tall and weighs 63 kg (140 lb); BMI is 21 kg/m^2. Blood pressure is 136/82 mm Hg. Examination of the lower extremities discloses normal flexion in both knees but decreased hyperextension in the right knee compared with the left knee. There is moderate medial joint line tenderness and a mild effusion of the right knee. Which of the following is the most appropriate recommendation at this time?

A) Intra-articular corticosteroid injection to the right knee
B) Muscle-strengthening exercises targeting the right quadriceps
C) Replacement of acetaminophen with hydrocodone-acetaminophen
D) Use of orthotic shoe inserts
E) Weight loss

Correct Answer: B.

Muscle-strengthening exercises targeting the right quadriceps is the most appropriate recommendation. Osteoarthritis is common in elderly patients and frequently involves the hip joints and the knees. Physical examination may disclose small to moderate joint effusions, tenderness along the medial joint line, and crepitus with flexion or extension. Initial treatment involves conservative care with the use of acetaminophen and the use of topical non-steroidal anti-inflammatory drugs such as diclofenac, but patients should always be assessed for factors that may contribute to their pain that can be treated with physical therapy. This patient has evidence of decreased knee extension and would likely benefit from physical therapy to strengthen his quadricep muscles. This may help to restore normal motion and improve his ability to extend his knee, which can sometimes substantially reduce pain.

Incorrect Answers: A, C, D, and E.

Intra-articular corticosteroid injection to the right knee (Choice A) is an effective treatment modality for patients who have not experienced improvement with physical therapy and other conservative measures.

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C) Replacement of acetaminophen with hydrocodone-acetaminophen

D) Use of orthotic shoe inserts

E) Weight loss

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Incorrect Answers: A, C, D, and E.

Intra-articular corticosteroid injection to the right knee (Choice A) is an effective treatment modality for patients who have not experienced improvement with physical therapy and other conservative measures.

Replacement of acetaminophen with hydrocodone-acetaminophen (Choice C) is incorrect. Opiates are generally not effective at treating osteoarthritis and also have the potential for addiction.

Use of orthotic shoe inserts (Choice D) is reasonable for patients with foot deformities such as flat feet but would be unlikely to benefit this patient.

Weight loss (Choice E) is recommended for all patients with osteoarthritis who are overweight or obese, but this patient has a normal BMI.

Educational Objective: Osteoarthritis is a common degenerative condition seen primarily in the elderly and frequently affects the joints of the hip or knee. In patients with muscle weakness causing decreased range of motion, physical therapy to strengthen surrounding musculature should be tried before more invasive strategies such as corticosteroid injections or knee replacement.

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22. A 23-year-old man who is a US Army veteran comes to the clinic because of a 2-month history of depressed mood; difficulty concentrating; decreased appetite; and decreased interest in his usual activities, such as exercising and spending time with friends. He also has had difficulty sleeping during this period, including being unable to fall asleep for 2 hours and then waking up "for no reason" in the middle of the night; he does not feel rested in the morning. He says that he sometimes thinks he would be better off dead, but he does not have any plans to harm himself. Physical examination shows no abnormalities. He asks for treatment with a medication that will not interfere with his sexual function. Which of the following medications is most appropriate for this patient at this time?

A) Fluoxetine
B) Mirtazapine
C) Nortriptyline
D) Paroxetine

Correct Answer: B.

Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). The most effective initial treatment includes psychotherapy and/or antidepressant medication. No particular class of antidepressant medication is more effective than the other, though different classes have different adverse effect profiles. As such, patient preferences about adverse effect profiles commonly influence medication choice. Serotonergic medications (eg, selective serotonin reuptake inhibitors, SSRIs) commonly impair sexual function within all three phases of sexual response (libido, sexual arousal, and orgasm). Mirtazapine, an atypical antidepressant medication, is a selective α_2-receptor antagonist and serotonin modulator that both increases serotonin release and antagonizes serotonin receptors. Because of its serotonin receptor antagonism, mirtazapine carries a decreased risk for sexual dysfunction compared to antidepressant medications that purely inhibit serotonin reuptake. Bupropion, an antidepressant that increases synaptic dopamine and norepinephrine, is another medication that carries a decreased risk for sexual dysfunction and is utilized as an augmentation agent to treat antidepressant-induced sexual dysfunction.

Incorrect Answers: A, C, and D.

Fluoxetine (Choice A) and paroxetine (Choice D) are SSRI medications utilized to treat depression and anxiety. Nortriptyline (Choice C) is a tricyclic antidepressant that is

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Incorrect Answers: A, C, and D.

Fluoxetine (Choice A) and paroxetine (Choice D) are SSRI medications utilized to treat depression and anxiety. Nortriptyline (Choice C) is a tricyclic antidepressant that is believed to inhibit the reuptake of serotonin and norepinephrine, among other mechanisms. All of these serotonin reuptake-inhibiting medications are commonly associated with sexual dysfunction.

Educational Objective: Antidepressant medications that increase synaptic serotonin commonly impair sexual function. Mirtazapine, a serotonin modulator that antagonizes serotonin receptors, and bupropion, an antidepressant that increases synaptic dopamine and norepinephrine, have been associated with a decreased risk for sexual dysfunction compared to other antidepressants.

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23. A 23-year-old woman comes to the office because of a 1-week history of moderate abdominal cramps and bloody diarrhea. She has no history of serious illness and takes no medications. There is no family history of gastrointestinal disease. The patient has not traveled recently or had sick contacts. Temperature is 37.2°C (99.0°F). While lying flat, pulse is 110/min and blood pressure is 100/70 mm Hg; while standing, pulse is 120/min and blood pressure is 90/60 mm Hg. The abdomen is mildly distended and soft; there is mild, diffuse tenderness to palpation. Hematocrit is 36%, and leukocyte count is 13,000/mm^3. Intravenous fluid therapy is begun. Stool culture results are negative. Colonoscopy shows inflamed mucosa and erythematous and raised mucosa over the rectum and sigmoid. The remainder of the colon appears normal. Colonic biopsy specimen shows crypt branching and abscesses. Which of the following is the most appropriate next step in pharmacotherapy?

A) Hydrocortisone therapy
B) Infliximab therapy
C) Mercaptopurine therapy
D) Methotrexate therapy
E) No pharmacotherapy is indicated

Correct Answer: A.

Hydrocortisone therapy is the most appropriate pharmacotherapy for this patient with clinical symptoms and colonoscopy findings consistent with ulcerative colitis (UC), a type of inflammatory bowel disease. UC frequently presents with symptoms of chronic cramping abdominal pain, tenesmus, and hematochezia with weight loss, but the spectrum of disease severity is variable. Patients with mild disease that is limited to the rectum may be treated with mesalamine suppositories alone, while patients with mild disease that extends to the sigmoid colon frequently require mesalamine or glucocorticoid enemas. Patients who continue to have symptoms despite topical treatments may experience improvement with oral mesalamine or oral steroids over a period of several weeks. Patients with disease refractory to initial therapy, or patients with higher clinical severity and more extensive involvement of the colon frequently require potent therapies to induce a remission. These may include systemic steroids such as prednisone, budesonide, or hydrocortisone. Additionally, newer biologic agents including anti-tumor necrosis factor medications or a Janus Kinase enzyme inhibitor (such as tofacitinib) may be warranted for both induction and maintenance of remission.

Incorrect Answers: B, C, D, and E.

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Incorrect Answers: B, C, D, and E.

Infliximab therapy (Choice B) may be considered as initial therapy for induction or may be used as a secondary medication if other treatment approaches fail. This patient may improve with early use of glucocorticoids followed by maintenance therapy with an oral agent such as mesalamine without requiring a tumor necrosis factor inhibitor.

Mercaptopurine therapy (Choice C) is not favored for the initial treatment of UC and does not reliably induce remission. It also has numerous adverse effects, including hepatocellular injury and leukopenia.

Methotrexate therapy (Choice D) is not a first-line medication for the treatment of UC, although it is sometimes used in patients who are unable to tolerate azathioprine or mercaptopurine.

No pharmacotherapy is indicated (Choice E) is incorrect. This patient's symptoms are unlikely to improve with watchful waiting alone.

Educational Objective: UC is an inflammatory bowel disease that can present with mild symptoms of abdominal cramping and scant hematochezia with disease limited to the rectum, or with severe, and sometimes fulminant inflammation of the entire colon with severe symptoms. Initial treatment depends on the severity and extent of inflammation. Patients with moderate or severe disease frequently require systemic glucocorticoids to induce remission, followed by maintenance therapy with mesalamine, sulfasalazine, other immunomodulators such as mercaptopurine, or anti-tumor necrosis factor-αmedications.

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24. A 21-year-old woman comes to student health services because of a 36-hour history of fever, sore throat, and headache. Two weeks ago, she was treated with a 5-day course of ibuprofen for muscle pain, fatigue, and malaise thought to be associated with a virus. She has no history of serious illness. Her only current medication is an oral contraceptive. Temperature is 38.3°C (101.0°F), pulse is 84/min, respirations are 12/min, and blood pressure is 115/75 mm Hg. Examination shows edema of the pharynx and tonsils. Multiple firm, mobile, tender lymph nodes are palpated in the cervical chain bilaterally. Cardiopulmonary examination shows no abnormalities. There is no abdominal tenderness. The spleen tip is palpated 5 cm below the left costal margin. Her leukocyte count is 14,000/mm^3 (40% segmented neutrophils, 3% eosinophils, 55% lymphocytes, and 2% monocytes). Monospot test is positive. The patient lives in a college dormitory. Use of which of the following measures by the patient is most likely to prevent transmission of her illness?

A) Frequent hand washing until symptoms resolve
B) Isolation until a second Monospot test is negative
C) Isolation until symptoms resolve
D) No specific measures are indicated

Correct Answer: D.

No specific measures are indicated. Infectious mononucleosis is a viral illness caused most often by the Epstein-Barr virus (EBV). EBV is transmitted through respiratory secretions and saliva, causing the illness to be commonly acquired by teenagers and young adults. Cytomegalovirus (CMV) is another less common cause of infectious mononucleosis and an acute HIV infection may also present with a similar syndrome. Clinically, the syndrome commonly presents with fever, lymphadenopathy (typically involving the posterior cervical lymph nodes), and hepatosplenomegaly along with pharyngitis. Patients with infectious mononucleosis will typically test positive on the Monospot test, which detects heterophile antibodies through the agglutination of sheep or horse erythrocytes. Treatment is supportive and patients should be counseled to avoid any contact sports until the splenomegaly has resolved because of the risk for splenic rupture. Mononucleosis is not particularly contagious, and although the virus is frequently shed in secretions for up to 6 months after recovery, no particular precautions are required in order to decrease the risk for disease transmission.

Incorrect Answers: A, B, and C.

Frequent hand washing until symptoms resolve (Choice A) may decrease the risk for acquiring or transmitting other viruses but is unlikely to have any effect on the transmission of EBV.

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Incorrect Answers: A, B, and C.

Frequent hand washing until symptoms resolve (Choice A) may decrease the risk for acquiring or transmitting other viruses but is unlikely to have any effect on the transmission of EBV.

Isolation until a second Monospot test is negative (Choice B) is unnecessary. There is no utility of obtaining a second test, and many patients are symptomatic for weeks without being infectious, so this approach is both unnecessary and impractical.

Isolation until symptoms resolve (Choice C) is not necessary as EBV is not particularly contagious.

Educational Objective: Mononucleosis is most commonly caused by infection with EBV, although CMV infection can cause a similar syndrome. Patients present with lymphadenopathy, pharyngitis, fatigue, and splenomegaly. EBV is not particularly contagious, so no specific precautions are necessary after the diagnosis is made.

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25. During a routine annual examination, an asymptomatic 46-year-old man is found to have a 1-cm prostatic nodule. Physical findings are otherwise normal. Which of the following is the most appropriate next step in management?

A) Reassurance and evaluation in 6 months
B) CT scan of the abdomen
C) Intravenous pyelography
D) Retrograde cystography
E) Prostatic biopsy

Correct Answer: E.

Prostatic biopsy is the most appropriate next step in management of this asymptomatic patient with a prostate nodule identified on digital rectal examination (DRE). Current clinical practice guidelines do not routinely recommend that all men undergo DRE for screenings purposes, but when DRE is performed and discloses an abnormality, further workup is indicated. In this instance, prostate biopsy, typically using ultrasonography guidance, is the next best step. Biopsy is usually considered in men who have a life expectancy greater than 10 years, as is the case for this patient, and have abnormalities on DRE, an increased prostate specific antigen (PSA), or a PSA that is rising rapidly. Further workup may include more advanced imaging such as MRI of the prostate or transrectal ultrasonography. Further therapy, if indicated, is based on the Gleason score, which is determined by histologic examination of the prostate biopsy.

Incorrect Answers: A, B, C, and D.

Reassurance and evaluation in 6 months (Choice A) is inappropriate for this patient with a detectable abnormality on DRE. Prostate biopsy is indicated.

CT scan of the abdomen (Choice B) is not part of the routine evaluation for prostate cancer and would be unlikely to provide useful or prognostic information.

Intravenous pyelography (Choice C) can be used to evaluate the renal collecting system but is not useful for the evaluation of prostate nodules. Additionally, its use has been largely supplanted by CT scans.

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Incorrect Answers: A, B, C, and D.

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Intravenous pyelography (Choice C) can be used to evaluate the renal collecting system but is not useful for the evaluation of prostate nodules. Additionally, its use has been largely supplanted by CT scans.

Retrograde cystography (Choice D) can evaluate the urethra, bladder, and ureters, but is not useful for evaluating prostate nodules.

Educational Objective: Routine DRE to screen for prostate cancer is not typically recommended any more, but if DRE is performed and a nodule is detected, further investigation with prostate biopsy and possibly with more advanced imaging modalities is indicated if the patient has a life expectancy of 10 years or more.

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26. A previously healthy 4-month-old boy is brought to the physician because of a 2-day history of fever and episodes of vomiting and crying. His temperature is 39.1°C (102.4°F), pulse is 142/min, respirations are 28/min, and blood pressure is 88/54 mm Hg. He is fussy but consolable. Examination shows an uncircumcised penis. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hematocrit	35%
Leukocyte count	19,500/mm^3
Platelet count	250,000/mm^3
Urine	
RBC	10/hpf
WBC	30/hpf

Urine culture grows greater than 100,000 colonies/mL of *Escherichia coli*. Blood culture is negative. Renal ultrasonography shows no abnormalities. Voiding cystourethrography shows a backflow of urine from the bladder to the renal pelvis. Which of the following is the most appropriate intervention to prevent future morbidity from this condition?

A) Low-sodium diet
B) Daily antibiotic therapy
C) Daily furosemide therapy
D) Circumcision
E) Vesicostomy

Correct Answer: B.

Urinary tract infections in males are uncommon, but risk factors include an age less than 1 year and congenital urinary tract abnormalities. Congenital urinary tract abnormalities include but are not limited to unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Regardless of the cause of malformation, ureteral obstruction and vesicoureteral reflux are common complications. Chronic reflux can lead to hydroureter and hydronephrosis, characterized by dilation of the renal pelvis and calyces resulting in compression

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D) Circumcision

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Incorrect Answers: A, C, D, and E.

Low-sodium diet (Choice A) is a lifestyle modification that can help in the management of hypertension. It has no role in the management of vesicoureteral reflux.

Daily furosemide therapy (Choice C) is typical in the management of congestive heart failure. It has no role in the management of vesicoureteral reflux.

Circumcision (Choice D) can decrease the risk for urinary tract infections but would not be an appropriate preventative therapy in this patient with vesicoureteral reflux shown on voiding cystourethrography.

Vesicostomy (Choice E) can be indicated in patients who are unable to void, such as in patients with posterior urethral valves or neurogenic bladder. It is a surgical procedure that allows for the creation of a small opening of the bladder to the skin surface.

Educational Objective: Vesicoureteral reflux increases the risk for recurrent urinary tract infections, including pyelonephritis, which can lead to complications such as renal scarring, hypertension, and chronic kidney disease. Prophylactic daily antibiotic therapy can help prevent the development of infections and consequent complications.

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27. A 14-year-old girl is brought to the physician because of a generalized itchy rash for 4 days. During this period, she has also had abdominal cramps, joint pain, and fever; she has not had double vision. She received an intramuscular injection of botulism antitoxin 10 days ago because of an outbreak of botulism at a restaurant where she had eaten. Immunizations are up-to-date. She appears mildly ill. Her temperature is 38.2°C (100.8°F). Examination shows mild facial edema. There are scattered, edematous, soft nodules over the trunk and extremities. Abdominal examination shows tenderness to palpation without rebound. Active and passive range of motion of the wrists, knees, and ankles is limited by pain. Which of the following is the most likely diagnosis?

A) Erythema nodosum
B) Lyme disease
C) Mucocutaneous lymph node syndrome (Kawasaki disease)
D) Rheumatic fever
E) *Salmonella enteritidis* infection
F) Serum sickness

Correct Answer: F.

Serum sickness is a type III hypersensitivity reaction, which is defined by the presence of circulating antigen-antibody complexes that deposit in tissues. Following deposition, the complexes trigger complement activation and an inflammatory cascade. It typically occurs after inoculation to a protein antigen from a non-human species such as equine botulism antitoxin, equine anti-thymocyte globulin, or murine monoclonal antibodies (eg, rituximab, infliximab). Some of these agents are now used infrequently, and the incidence of true serum sickness has declined but serum sickness-like reactions still occur. The most frequent clinical features are fever, malaise, rash (often urticarial, but can vary in appearance), and arthralgias or arthritis. The joints are particularly prone to immune complex deposition, which is possibly caused by fenestrations in the synovial endothelial cells allowing diffusion of the proteins into joint spaces. Symptoms usually occur 1 to 2 weeks after initial exposure to the drug, but on re-exposure, symptoms may develop sooner. When the causative agent is removed from the system, serum sickness improves. Supportive treatment with analgesics, non-steroidal anti-inflammatory agents, and antihistamines can be used in the meantime.

Incorrect Answers: A, B, C, D, and E.

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infrequently, and the incidence of true serum sickness has declined but serum sickness-like reactions still occur. The most frequent clinical features are fever, malaise, rash (often urticarial, but can vary in appearance), and arthralgias or arthritis. The joints are particularly prone to immune complex deposition, which is possibly caused by fenestrations in the synovial endothelial cells allowing diffusion of the proteins into joint spaces. Symptoms usually occur 1 to 2 weeks after initial exposure to the drug, but on re-exposure, symptoms may develop sooner. When the causative agent is removed from the system, serum sickness improves. Supportive treatment with analgesics, non-steroidal anti-inflammatory agents, and antihistamines can be used in the meantime.

Incorrect Answers: A, B, C, D, and E.

Erythema nodosum (Choice A) is an inflammatory disorder of the subcutaneous fat which is triggered most commonly by streptococcal infection as well as numerous drugs, pregnancy, malignancy, or sarcoidosis or may be idiopathic. It classically presents as tender, erythematous, subcutaneous nodules on the shins.

Lyme disease (Choice B) is a tick-borne disease caused by *Borrelia burgdorferi*. In its early stages, it causes erythema chronicum migrans, an expanding rash that may have a central ring-like clearing. Later stages of Lyme disease can be characterized by carditis, atrioventricular heart block, facial nerve palsy, migratory arthralgias, and if left untreated, encephalopathy and chronic arthritis.

Mucocutaneous lymph node syndrome (Kawasaki disease) (Choice C) is a multisystemic vasculitic disease in children characterized by fever for at least 5 days, bilateral nonexudative conjunctivitis, a polymorphous rash, lymphadenopathy, erythema and edema of the hands and feet, and erythema affecting the mucous membranes with dry, cracked lips. Arthritis is seen in less than 25% of patients.

Rheumatic fever (Choice D) classically presents with migratory polyarthralgia, pancarditis (pericarditis, myocarditis, or endocarditis), subcutaneous nodules, erythema marginatum, Sydenham chorea, fever, increased erythrocyte sedimentation rate, and short PR interval on ECG following an infection from Group A β-hemolytic streptococci, frequently pharyngitis.

Salmonella enteritidis (Choice E) is a cause of nontyphoidal *Salmonella* infection. Clinical features include fever, nausea, vomiting, and abdominal cramping.

Educational Objective: Serum sickness is a type III hypersensitivity reaction caused by the deposition of circulating antigen-antibody complexes in tissue leading to an inflammatory cascade. It is often triggered by protein antigens from non-human species such as equine anti-thymocyte globulin or equine botulism antitoxin. Clinical features include fever, malaise, rash, and arthralgias or arthritis, 8which remit after the causative agent is stopped.

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28. An 11-year-old boy is brought to the emergency department 40 minutes after he was found slumped over in an alley. He appears somewhat disheveled and dirty. He is groggy and somewhat confused but smiling. He is unable to give coherent answers to most questions, and his speech is slurred. His pulse is 124/min, respirations are 10/min, and blood pressure is 100/62 mm Hg while supine and 82/48 mm Hg while sitting. Pupils are 5 mm and reactive to light. There is occasional nystagmus on lateral gaze. He falls asleep in the examining room. Intoxication with which of the following is the most likely cause of this patient's condition?

A) Amphetamines
B) Heroin
C) Inhalants
D) LSD
E) Marijuana

Correct Answer: C.

Inhalant abuse (eg, toluene, nitrous oxide, spray paint, glue) is common in children and adolescents. The effects typically begin within seconds of use and persist for approximately 30 minutes, representing a faster onset and resolution compared to other recreational drugs. Inhalants exert effects on multiple organ systems: dermatologic (eg, perioral or perinasal dermatitis), otolaryngologic (eg, nosebleeds, halitosis), ocular (eg, conjunctival injection), cardiac (eg, dysrhythmia, tachycardia, orthostatic hypotension), gastrointestinal (eg, nausea, anorexia), respiratory (eg, wheezing, coughing), and neuropsychiatric (eg, altered mental status, headache, ataxia, nystagmus, anosmia, slurred speech, mood swings, hallucinations). Severe inhalant toxicity can manifest with tachydysrhythmias and respiratory depression, and ultimately seizures or coma. Treatment is primarily supportive, though some inhalants have specific antidotes (eg, methylene blue for nitrites). Prevention is key; schools should monitor use of solvent-based products, and parents and children should be educated about the risks of inhalants.

Incorrect Answers: A, B, D, and E.

Amphetamine (Choice A) intoxication leads to elevated mood, loss of inhibition, hyperpyrexia, sympathetic excess, and increased thirst. Amphetamines do not often affect coordination; patients typically do not present with ataxia or slurred speech.

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Correct Answer: C.

Inhalant abuse (eg, toluene, nitrous oxide, spray paint, glue) is common in children and adolescents. The effects typically begin within seconds of use and persist for approximately 30 minutes, representing a faster onset and resolution compared to other recreational drugs. Inhalants exert effects on multiple organ systems: dermatologic (eg, perioral or perinasal dermatitis), otolaryngologic (eg, nosebleeds, halitosis), ocular (eg, conjunctival injection), cardiac (eg, dysrhythmia, tachycardia, orthostatic hypotension), gastrointestinal (eg, nausea, anorexia), respiratory (eg, wheezing, coughing), and neuropsychiatric (eg, altered mental status, headache, ataxia, nystagmus, anosmia, slurred speech, mood swings, hallucinations). Severe inhalant toxicity can manifest with tachydysrhythmias and respiratory depression, and ultimately seizures or coma. Treatment is primarily supportive, though some inhalants have specific antidotes (eg, methylene blue for nitrites). Prevention is key; schools should monitor use of solvent-based products, and parents and children should be educated about the risks of inhalants.

Incorrect Answers: A, B, D, and E.

Amphetamine (Choice A) intoxication leads to elevated mood, loss of inhibition, hyperpyrexia, sympathetic excess, and increased thirst. Amphetamines do not often affect coordination; patients typically do not present with ataxia or slurred speech.

Heroin (Choice B) is an opiate. Opiates are central nervous system depressants that cause sedation, bradycardia and hypotension, depressed respiratory drive, and constricted pupils. Tachycardia, nystagmus, and ataxia would be atypical.

LSD (Choice D) is a potent hallucinogen known to cause auditory and visual hallucinations, depersonalization, flashbacks, and paranoia. Disorientation and mild sympathetic activation may occur in severe cases. Nystagmus and ataxia would be uncommon.

Marijuana (Choice E) is a hallucinogen that causes euphoria, paranoia, hallucinations, increased appetite, conjunctival injection, and cognitive slowing. Nystagmus, ataxia, and slurred speech may also occur. However, patients with depressed mental status secondary to marijuana intoxication more commonly demonstrate bradycardia. As well, orthostatic hypotension in children intoxicated with marijuana would be atypical.

Educational Objective: Inhalant abuse commonly presents with neuropsychiatric (eg, altered mental status, headache, ataxia, slurred speech, mood swings, hallucinations) and cardiac (eg, dysrhythmia, tachycardia, orthostatic hypotension) manifestations, along with effects in dermatologic, ocular, otolaryngologic, gastrointestinal, and respiratory systems.

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29. A 25-year-old man comes to the physician for an examination prior to starting an exercise program consisting of swimming four times weekly. He feels well but wants to change his sedentary lifestyle. He has smoked one-half pack of cigarettes daily for 9 years. His father had a myocardial infarction at the age of 52 years. The patient is 178 cm (5 ft 10 in) tall and weighs 109 kg (240 lb); BMI is 34 kg/m^2. His pulse is 76/min, and blood pressure is 138/76 mm Hg. The remainder of the examination and an ECG show no other abnormalities. In addition to obtaining serum lipid studies and recommending that the patient stop smoking, which of the following is the most appropriate next step in management?

A) Approval of the exercise program
B) Exercise stress test
C) Echocardiography
D) 24-Hour ambulatory ECG monitoring
E) Cardiac catheterization

Correct Answer: A.

Approval of the exercise program and consistent participation are likely to have the greatest effects on the patient's health and future cardiovascular disease risk profile at this time. Increased BMI and a sedentary lifestyle are associated with a variety of adverse outcomes including myocardial infarction, coronary artery disease, stroke, and overall mortality. The first-line preventative strategy involves lifestyle modification with improvement of diet and exercise. Regular aerobic exercise results in improved serum lipid studies, better control of hypertension, and decreased lifetime risk for cardiovascular disease. Patients who are overweight or obese may also benefit from additional weight loss programs and dietary modification.

Incorrect Answers: B, C, D, and E.

Exercise stress test (Choice B) is not indicated for this young, asymptomatic patient. Stress testing is recommended for patients with angina, prior acute coronary syndrome with new or changing symptoms, or for valvular disease, cardiomyopathy, or congestive heart failure in certain settings. Similarly, cardiac catheterization (Choice E) would be an unnecessary, invasive procedure without benefit at this time.

Echocardiography (Choice C) is unlikely to provide useful information in the absence of symptoms or abnormal physical examination findings

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Echocardiography (Choice C) is unlikely to provide useful information in the absence of symptoms or abnormal physical examination findings.

24-Hour ambulatory ECG monitoring (Choice D) is not indicated in the absence of palpitations, presyncope or syncope, or a family history of sudden death.

Educational Objective: Lifestyle modifications involving increased physical activity, dietary modifications, and weight management are essential components of management plans to reduce risk for future cardiovascular disease. Other modifiable risk factors, such as hyperlipidemia and tobacco use, should be screened for and managed as well.

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30. A 32-year-old woman comes to an emergency department in New England because of a 5-day history of fever. She has not had any other symptoms. She has no history of serious illness and takes no medications. She has been sexually active with one male partner for 5 years, and they use condoms consistently. She has a healthy 2-year-old son. She immigrated to the USA from Kenya 6 weeks ago. She appears ill. Her temperature is 38.9°C (102°F), pulse is 90/min, and blood pressure is 110/70 mm Hg. The remainder of the examination shows no abnormalities. Her hematocrit is 29%, leukocyte count is 6000/mm^3 (88% segmented neutrophils, 10% lymphocytes, and 2% monocytes), and serum lactate dehydrogenase activity is 450 U/L. Which of the following is the most likely causal organism?

A) *Borrelia burgdorferi*
B) Hepatitis B virus
C) HIV
D) *Plasmodium falciparum*
E) *Staphylococcus aureus*

Correct Answer: D.

Malaria is an infectious disease caused by pathogenic protozoa of the genus *Plasmodium*. Species that cause disease in humans include *Plasmodium falciparum*, *P. ovale, P. vivax, P. knowlesi,* and *P. malariae*. Malaria typically presents with fatigue, fever, chills, and anemia in a patient with recent exposure to an endemic region, particularly within the tropical latitudes of Africa or Central or South America. The organism is transmitted through bites of female *Anopheles* mosquitos. In the human host, the protozoa ultimately invade and rupture erythrocytes, resulting in anemia and increased serum lactate dehydrogenase concentrations. Diagnosis can be confirmed by rapid antigen testing and with visualization of characteristic trophozoite and schizont forms within erythrocytes. *Plasmodium falciparum* infection in particular can be complicated by severe disease including cerebral malaria and acute renal failure. A cyclic fever recurring over the course of 2 to 3 days is a classic association.

Incorrect Answers: A, B, C, and E.

Borrelia burgdorferi (Choice A) is the organism responsible for Lyme disease. Lyme disease is only endemic to certain parts of the United States and is transmitted by bites from the deer tick, *Ixodes scapularis*. Patients classically present with a characteristic rash known as erythema migrans.

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D) *Plasmodium falciparum*

E) *Staphylococcus aureus*

Correct Answer: D.

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Hepatitis B virus (Choice B) is transmitted through blood, sexual contact, or perinatally. Chronic infection can lead to cirrhosis and hepatocellular carcinoma. Acute viral hepatitis typically presents with fever, fatigue, right upper quadrant abdominal pain, jaundice, and increased concentrations on liver function studies. Anemia is not typical in acute disease.

HIV (Choice C) can present with an acute retroviral syndrome that resembles infectious mononucleosis, with fever, pharyngitis, lymphadenopathy, diffuse rash, and arthralgias. Chronic infection results in acquired immunodeficiency syndrome (AIDS) with increased risk for various opportunistic infections.

Staphylococcus aureus (Choice E) is a gram-positive bacterium that causes multiple types of infections including skin and soft tissue infections, pneumonia, endocarditis, and bacteremia. In an otherwise healthy young patient who has recently traveled from an endemic region, malaria is the most likely cause of acute fever.

Educational Objective: Malaria is an infectious disease caused by protozoa of the genus *Plasmodium*. Malaria should be considered in any patient presenting with fever in the setting of recent exposure to an endemic region.

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31. A 42-year-old woman, gravida 2, para 2, comes to the physician because of a 10-month history of severe menstrual cramps and increased menstrual flow. Menses occur at regular 30- to 32-day intervals and last 4 to 6 days. She has severe cramps and heavy flow for the first 4 days of menses. She previously had heavy flow only for the first 2 days of menses. She has not had passage of clots or breakthrough bleeding. She has no history of serious illness. Her temperature is 37°C (98.6°F), pulse is 84/min, respirations are 18/min, and blood pressure is 130/80 mm Hg. Physical examination shows no abnormalities. Pelvic examination shows a smooth, globular-shaped, mobile uterus consistent in size with a 10-week gestation; there is mild tenderness to palpation with no contour abnormalities. Examination shows no adnexal tenderness or masses. Pelvic ultrasonography, including sonohysterography, shows diffuse uterine enlargement and a normal endometrial cavity. Which of the following is the most likely cause of this patient's menstrual symptoms?

A) Adenomyosis
B) Endometrial carcinoma
C) Endometrial polyp
D) Leiomyomata uteri
E) Polycystic ovarian syndrome

Correct Answer: A.

This patient is presenting with heavy menstrual bleeding and dysmenorrhea, with a globular uterus on physical examination and diffuse uterine enlargement on ultrasonography, making adenomyosis the most likely diagnosis. Adenomyosis describes the growth of endometrial glands within the myometrium. The endometrial tissue remains hormonally responsive, and thus undergoes cyclic transformation, with bleeding of the endometrial tissue causing the presenting complaints. It commonly presents with abnormal uterine bleeding, particularly menorrhagia, along with dysmenorrhea and pelvic pain. Physical examination will demonstrate a large, globular, and boggy uterus. It is more common in multigravid women and those aged 40 to 50 years. However, it may also occur in younger patients and can be associated with infertility, miscarriage, and preterm birth. Further evaluation may include transvaginal ultrasonography or MRI, with signs of adenomyosis including a diffusely enlarged uterus, asymmetrical myometrial thickening, loss of the endomyometrial border, and subendometrial cysts. Definitive treatment consists of hysterectomy, although progesterone IUDs, gonadotropin-releasing hormone analogs, and aromatase inhibitors can be used to more conservatively manage symptoms.

Incorrect Answers: B, C, D, and E.

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Incorrect Answers: B, C, D, and E.

Endometrial carcinoma (Choice B) often presents with abnormal uterine bleeding in postmenopausal women or in premenopausal women with a history of prolonged exposure to estrogen (eg, obesity, nulliparity, diabetes mellitus, exogenous estrogen therapy). Physical examination is often normal, with pelvic ultrasonography showing an enlarged endometrial stripe. This patient has no risk factors for endometrial cancer and has a normal endometrial cavity on ultrasonography, making endometrial carcinoma less likely.

Endometrial polyps (Choice C) may cause bleeding that is irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). They do not cause uterine enlargement and would likely be evident on ultrasonography.

Leiomyomata uteri (Choice D), also known as uterine fibroids, are benign neoplasms of the uterine myometrium. They are a potential cause of abnormal uterine bleeding and pelvic pain, often in women of African American descent. They can cause asymmetric enlargement of the uterus on pelvic examination but would be evident on ultrasonography.

Polycystic ovarian syndrome (Choice E) most commonly presents with hirsutism, increased body weight, and anovulation leading to irregular menstrual bleeding and infertility. Ultrasonography of the pelvis commonly shows enlarged ovaries containing numerous follicular cysts. It does not typically cause uterine enlargement.

Educational Objective: Adenomyosis commonly presents with heavy, painful menstrual bleeding caused by the presence of endometrial glands within the myometrium. It is more common in multigravid women aged 40 to 50 years. Physical examination may disclose an enlarged, globular, boggy uterus. Definitive treatment includes hysterectomy.

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32. A study is conducted to assess the efficacy of a new medication to relieve pain. A total of 1000 patients with pain are enrolled and randomly assigned to receive either the new drug or the standard care. Results show that the new drug is more effective than the standard care, but 2.4% of patients receiving the new drug developed new-onset hypertension, compared with 1.6% of patients receiving the standard care. Based on these results, which of the following is the number needed to harm with the new drug to cause new-onset hypertension in one patient?

A) 50
B) 75
C) 100
D) 125
E) 150

Correct Answer: D.

Number needed to harm (NNH) is an epidemiologic measure used to characterize the risk associated with a particular intervention. Formally, the NNH is the number of patients who must receive an intervention in order to result in one negative outcome associated with the intervention. For example, a cardiovascular drug that needs to be given to 100 people in order to result in one adverse event would have an NNH of 100. Absolute risk increase (ARI) can be calculated as the difference between the adverse incident rate in the experimental group and the control group. In this case, 2.4% of patients receiving the new drug developed new-onset hypertension, compared with 1.6% of patients receiving the standard care, and thus ARI = 2.4% – 1.6% = 0.8%. NNH can then be calculated as the inverse of ARI, 1/ARI or NNH = 1/0.8% = 125. Alternatively, NNH can also be calculated as the inverse of the attributable risk (AR) using a contingency table.

Incorrect Answers: A, B, C, and E.

Choices A, B, C, and E represent mathematical errors or incorrect calculations of NNH or ARI. These are not feasible answers given the provided statistics and formula for NNH, which is equal to 1/ARI.

Educational Objective: Number needed to harm is an epidemiologic measure used to characterize the risk associated with a particular intervention. It represents the

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Educational Objective: Number needed to harm is an epidemiologic measure used to characterize the risk associated with a particular intervention. It represents the number of patients who must receive an intervention in order to result in one negative outcome associated with the intervention. NNH can be calculated as the inverse of the absolute risk increase (ARI), such that NNH = 1/ARI.

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33. A 42-year-old woman comes to the physician because of a 4-week history of progressive generalized weakness and urinary frequency. She says that she needs to stop and rest halfway up the stairs in her home and that she also has difficulty carrying grocery bags. She has no history of serious illness and takes no medications. Her younger sister and brother have hypertension. Her pulse is 88/min, respirations are 18/min, and blood pressure is 174/102 mm Hg. Funduscopic examination shows mild arteriovenous nicking. Muscle strength is 5/5 throughout, and reflexes are normal. Serum studies show:

Na^+	143 mEq/L
K^+	3.0 mEq/L
Cl^-	102 mEq/L
HCO_3^-	30 mEq/L

Which of the following additional serum findings are most likely in this patient?

	Aldosterone Concentration	Renin Activity
A)	Decreased	decreased
B)	Decreased	increased
C)	Decreased	normal
D)	Increased	decreased
E)	Increased	increased
F)	Normal	decreased
G)	Normal	increased

Correct Answer: D.

The patient's symptoms and electrolyte studies are concerning for hyperaldosteronism, and serum findings of increased aldosterone concentration and decreased renin

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B)	Decreased	increased
C)	Decreased	normal
D)	Increased	decreased
E)	Increased	increased
F)	Normal	decreased
G)	Normal	increased

Correct Answer: D.

The patient's symptoms and electrolyte studies are concerning for hyperaldosteronism, and serum findings of increased aldosterone concentration and decreased renin activity are expected. Aldosterone is produced by the zona glomerulosa of the adrenal cortex and plays an important role in the maintenance of blood volume and sodium homeostasis, primarily through the renin-angiotensin-aldosterone pathway. Renin is produced by the juxtaglomerular cells as a response to decreased blood flow to the renal system, decreased sodium delivery to the macula densa, or increased sympathetic tone. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme (ACE). Angiotensin II subsequently signals the adrenal gland to secrete aldosterone. Aldosterone promotes the reabsorption of sodium ions in exchange for potassium and hydrogen ion secretion in the distal convoluted tubule and collecting ducts, causing the indirect reabsorption of water, which results in the development of hypertension. Increased concentrations of aldosterone provide negative feedback to renin, decreasing its production. Primary hyperaldosteronism presents with hypertension, metabolic alkalosis, hypokalemia, and an increased aldosterone-to-renin ratio caused by the independent secretion of aldosterone, most commonly from an adrenal adenoma, bilateral adrenal hyperplasia, or familial hyperaldosteronism.

Incorrect Answers: A, B, C, E, F, and G.

Choice A is consistent with Liddle syndrome, with decreased aldosterone and renin concentrations. Liddle syndrome is a congenital disorder of the collecting tubules caused by gain-of-function mutations in epithelial sodium channels. Increased sodium reabsorption leads to hypertension, hypokalemia, and metabolic alkalosis, and suppression of the renin-aldosterone system.

Choices B and G, with increased renin and decreased or inappropriately normal concentration of aldosterone, are suggestive of adrenal insufficiency. Common causes of adrenal insufficiency include autoimmune adrenalitis, infections (tuberculosis, histoplasmosis, HIV, Waterhouse-Friedrichsen syndrome with Neisseria meningitidis infection), malignancy, exogenous steroid use, and traumatic brain injury

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Choice C is suggestive of aldosterone deficiency secondary to impaired stimulation from renin. This may occur in the setting of diabetic nephropathy or with exposure to medications such as nonsteroidal anti-inflammatory agents and calcineurin inhibitors.

Choice E represents a physiologic response to low renal blood flow with stimulation of renin secretion from the juxtaglomerular apparatus and appropriate response from the adrenal glands. This pattern may also be caused by a renin-secreting tumor.

Choice F, with decreased renin and normal aldosterone concentrations, may be observed in some patients with essential hypertension (termed low-renin essential hypertension) or in older patients. A diagnosis of primary hyperaldosteronism may be considered as well, though increased aldosterone concentration is more commonly observed.

Educational Objective: Primary hyperaldosteronism presents with hypertension, metabolic alkalosis, hypokalemia, and an increased aldosterone-to-renin ratio caused by the independent secretion of aldosterone, most commonly from an adrenal adenoma, bilateral adrenal hyperplasia, or familial hyperaldosteronism.

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34. A previously healthy 16-year-old girl is admitted to the hospital because of a 4-day history of fever, malaise, headache, and abdominal pain. She was present at the site of a suspected bioterrorism attack 14 days ago. Her temperature is 40°C (104°F), pulse is 96/min, respirations are 16/min, and blood pressure is 110/70 mm Hg. After 1 day of supportive therapy, her fever subsides, but there are vesicular lesions at the same stage of development primarily over the mouth, face, and extremities with limited distribution across the trunk. Immunization of the patient's contacts with which of the following is most likely to prevent the spread of this illness?

A) Anthrax
B) Plague
C) Rubella
D) Vaccinia
E) Varicella

Correct Answer: D.

Immunization with vaccinia is most likely to prevent spread of the illness to the patient's contacts because her presentation is concerning for smallpox. Vaccinia is a live poxvirus that was used in vaccination campaigns to successfully eradicate variola (the virus that causes smallpox) from the global population. Bioterrorism is considered the most likely potential cause of new cases. Smallpox presents with an initial prodrome characterized by fever, chills, headache, pharyngitis, and musculoskeletal pain. A fine macular rash may be present. After the prodromal phase, the characteristic vesicular rash develops, with initial red non-blanching macules that develop into large vesicles and pustules. Skin and mucosa can both be affected, and the face and upper body are commonly involved. Lesions tend to scab over around 2 weeks into the illness. Notably, the vesicular lesions tend to progress through stages of development together at the same rate. Treatment is supportive.

Incorrect Answers: A, B, C, and E.

Anthrax (Choice A) refers to illness caused by *Bacillus anthracis*, a gram-positive rod notable for spore formation and toxin production. There are several manifestations of anthrax. Cutaneous anthrax is characterized by a painless necrotic ulcer and is generally treatable and nonfatal. Pulmonary anthrax causes a flu-like illness, fever, mediastinitis, pulmonary hemorrhage, and if it leads to septic or hemorrhagic shock is often fatal. Intestinal anthrax presents with nausea, vomiting, and diarrhea. A

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Immunization with vaccinia is most likely to prevent spread of the illness to the patient's contacts because her presentation is concerning for smallpox. Vaccinia is a live poxvirus that was used in vaccination campaigns to successfully eradicate variola (the virus that causes smallpox) from the global population. Bioterrorism is considered the most likely potential cause of new cases. Smallpox presents with an initial prodrome characterized by fever, chills, headache, pharyngitis, and musculoskeletal pain. A fine macular rash may be present. After the prodromal phase, the characteristic vesicular rash develops, with initial red non-blanching macules that develop into large vesicles and pustules. Skin and mucosa can both be affected, and the face and upper body are commonly involved. Lesions tend to scab over around 2 weeks into the illness. Notably, the vesicular lesions tend to progress through stages of development together at the same rate. Treatment is supportive.

Incorrect Answers: A, B, C, and E.

Anthrax (Choice A) refers to illness caused by *Bacillus anthracis*, a gram-positive rod notable for spore formation and toxin production. There are several manifestations of anthrax. Cutaneous anthrax is characterized by a painless necrotic ulcer and is generally treatable and nonfatal. Pulmonary anthrax causes a flu-like illness, fever, mediastinitis, pulmonary hemorrhage, and if it leads to septic or hemorrhagic shock is often fatal. Intestinal anthrax presents with nausea, vomiting, and diarrhea. A vesicular rash is not associated with anthrax.

Plague (Choice B) most commonly refers to *Yersinia pestis*, the gram-negative bacillus that causes bubonic plague. Disease manifestations range from local ulceroglandular disease to sepsis, meningitis, and pneumonia. It is acquired through contact with infected animals, through flea bites, or through inhalation of droplets from infected humans.

Rubella (Choice C) is caused by a togavirus of the same name that is spread through respiratory secretions or through vertical transmission in pregnant patients. Symptoms include fever, arthralgias, and lymphadenopathy (most often postauricular) with a confluent rash that spreads from the head to the trunk and then centrifugally to the extremities.

Varicella (Choice E), which causes the disease chicken pox, also presents with a characteristic vesicular rash. Chicken pox can be distinguished from smallpox by absence of a significant prodromal phase, and presence of vesicular lesions that are in different stages of development and healing.

Educational Objective: Smallpox is a viral illness caused by variola that is characterized by a febrile prodromal phase followed by a characteristic vesicular rash with lesions in the same stage of development and healing. Smallpox has been eradicated from the general population because of global vaccination using vaccinia, a live-attenuated poxvirus.

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35. A 47-year-old man comes to the emergency department 12 hours after the onset of severe shortness of breath, dizziness, and generalized weakness. He has type 2 diabetes mellitus treated with metformin and insulin. He has had 19 visits to the emergency department during the past 3 years because of poor blood glucose control. He has smoked two packs of cigarettes daily for 30 years. His temperature is 38.6°C (101.4°F), pulse is 110/min, respirations are 34/min, and blood pressure is 90/70 mm Hg. A photograph of the plantar aspect of the right foot is shown. Laboratory studies show:

Hemoglobin	11.5 g/dL
Hematocrit	35%
Leukocyte count	26,000/mm^3

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Hemoglobin	11.5 g/dL
Hematocrit	35%
Leukocyte count	26,000/mm^3
Serum	
Na^+	132 mEq/L
K^+	5.4 mEq/L
Cl^-	95 mEq/L
HCO_3^-	13 mEq/L
Urea nitrogen	29 mg/dL
Glucose	733 mg/dL
Creatinine	1.6 mg/dL

Arterial blood gas analysis on room air shows:

pH	7.22
Pco_2	21 mm Hg
Po_2	98 mm Hg

Intravenous fluids, antibiotics, and insulin are administered. Which of the following is the most appropriate next step in diagnosis?

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pH	7.22
Pco_2	21 mm Hg
Po_2	98 mm Hg

Intravenous fluids, antibiotics, and insulin are administered. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of hemoglobin A_{1c}
B) Measurement of serum osmolality
C) Measurement of urinary glucose concentration
D) X-rays of the foot
E) Ultrasonography of the foot

Correct Answer: D.

X-rays of the foot are the most appropriate next step in diagnosis of this patient. The patient has poorly controlled type 2 diabetes mellitus and is presenting with signs of sepsis including fever, tachycardia, hypotension, leukocytosis, and anion gap metabolic acidosis. Examination of the foot demonstrates a deep ulcer several centimeters in diameter with areas of fibrinous slough and possible tendon or bone exposure. The ulcer may be the source of infection causing his systemic illness. A combination of factors leads to increased risk for foot infections in diabetic patients. These include immune compromise inherent to diabetes, decreased sensation in the feet allowing deep wounds to go undetected by patients, decreased motor function leading to altered pressure points and swelling of the lower extremities, and decreased autonomic nervous system function leading to impaired sweat regulation and increased risk for dryness, cracking, and fissuring on the feet causing portals for bacterial entry. When a diabetic foot ulcer is present, x-rays of the foot will help to evaluate for the presence of osteomyelitis and gas in the soft tissue, either of which could require surgical management and will dictate the treatment plan for this patient. Most diabetic patients with osteomyelitis do not respond to medical management alone and often benefit from surgical resection, generally amputation.

Incorrect Answers: A, B, C, and E.

Measurement of hemoglobin A_{1c} (Choice A) or measurement of urinary glucose concentration (Choice C) may help to quantify the severity of this patient's diabetes

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E) Ultrasonography of the foot

Correct Answer: D.

X-rays of the foot are the most appropriate next step in diagnosis of this patient. The patient has poorly controlled type 2 diabetes mellitus and is presenting with signs of sepsis including fever, tachycardia, hypotension, leukocytosis, and anion gap metabolic acidosis. Examination of the foot demonstrates a deep ulcer several centimeters in diameter with areas of fibrinous slough and possible tendon or bone exposure. The ulcer may be the source of infection causing his systemic illness. A combination of factors leads to increased risk for foot infections in diabetic patients. These include immune compromise inherent to diabetes, decreased sensation in the feet allowing deep wounds to go undetected by patients, decreased motor function leading to altered pressure points and swelling of the lower extremities, and decreased autonomic nervous system function leading to impaired sweat regulation and increased risk for dryness, cracking, and fissuring on the feet causing portals for bacterial entry. When a diabetic foot ulcer is present, x-rays of the foot will help to evaluate for the presence of osteomyelitis and gas in the soft tissue, either of which could require surgical management and will dictate the treatment plan for this patient. Most diabetic patients with osteomyelitis do not respond to medical management alone and often benefit from surgical resection, generally amputation.

Incorrect Answers: A, B, C, and E.

Measurement of hemoglobin A_{1c} (Choice A) or measurement of urinary glucose concentration (Choice C) may help to quantify the severity of this patient's diabetes mellitus but will not address the infection driving his systemic illness.

Measurement of serum osmolality (Choice B) will help determine if this patient has hyperosmotic hyperglycemic state (HHS), which may be present in conjunction with an underlying infection. HHS typically demonstrates pH >7.3 and HCO_3^- >20 mEq/L while this patient has a pH of 7.22 and HCO_3^- of 13 mEq/L. The patient's laboratory values along with his fever, hypotension, and leukocytosis suggest the presence of sepsis for which evaluation and management take precedence in this case. Notably, in this case, initiating the patient on intravenous fluids and insulin will resolve HHS if it is concomitantly present regardless of whether it is formally diagnosed.

Ultrasonography of the foot (Choice E) will not be as helpful as x-ray in determining the presence of osteomyelitis or subcutaneous emphysema in the foot.

Educational Objective: Diabetic patients are at an increased risk for soft tissue infections over the feet because of decreased immune status and neuropathy of sensory, motor, and autonomic nerves. Deep ulcers that have exposed bone or probe to bone may be complicated by osteomyelitis or gas gangrene. X-ray of the foot is the best initial diagnostic imaging modality for evaluating for osteomyelitis or gas in the soft tissue.

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36. A 77-year-old woman, gravida 4, para 4, is admitted to the hospital for treatment of pneumonia. On hospital day 4, she has an episode of severe coughing, after which she states that she has had involuntary loss of urine. She states that she feels like "something is bulging" from her vagina. Her four pregnancies were uncomplicated and ended in spontaneous vaginal deliveries. Menopause occurred 25 years ago. She has not had postmenopausal bleeding and has never received hormone therapy. Her temperature is 37°C (98.6°F), pulse is 75/min, respirations are 18/min, and blood pressure is 140/90 mm Hg. Abdominal examination shows no abnormalities. The external genitalia are atrophic but otherwise normal. The anterior vaginal segment is descended halfway past the hymenal ring. Speculum examination shows a normal cervix. The uterus is small, nontender, and anteflexed, and there are no adnexal masses. Rectal examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Cystocele
B) Enterocele
C) Rectocele
D) Uterine inversion
E) Uterine prolapse

Correct Answer: A.

This patient presents with stress incontinence, or urinary incontinence with increased intraabdominal pressure, in the setting of vaginal pelvic organ prolapse. A cystocele is common in multiparous women because weakness of the pelvic floor allows the bladder to prolapse against the anterior vaginal wall. In addition to causing stress urinary incontinence, as in this patient, it can also cause urinary retention or incomplete bladder emptying. Physical examination most commonly discloses a bulge on the anterior vaginal wall, but urethral hypermobility is typically absent. Further evaluation often includes urodynamic testing, which allows for the measurement of bladder volume and pressure, the abdominal pressure at which bladder leakage occurs, bladder emptying, urethral function, and urine flow rates. Therapeutic options for stress incontinence caused by a cystocele include physical therapy, pelvic floor pessaries, and surgical correction.

Incorrect Answers: B, C, D, and E.

Enterocele (Choice B) occurs when the small bowel prolapses against the superior wall of the vagina, with a visible bulge usually present on physical examination. It is not

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E) Uterine prolapse

Correct Answer: A.

This patient presents with stress incontinence, or urinary incontinence with increased intraabdominal pressure, in the setting of vaginal pelvic organ prolapse. A cystocele is common in multiparous women because weakness of the pelvic floor allows the bladder to prolapse against the anterior vaginal wall. In addition to causing stress urinary incontinence, as in this patient, it can also cause urinary retention or incomplete bladder emptying. Physical examination most commonly discloses a bulge on the anterior vaginal wall, but urethral hypermobility is typically absent. Further evaluation often includes urodynamic testing, which allows for the measurement of bladder volume and pressure, the abdominal pressure at which bladder leakage occurs, bladder emptying, urethral function, and urine flow rates. Therapeutic options for stress incontinence caused by a cystocele include physical therapy, pelvic floor pessaries, and surgical correction.

Incorrect Answers: B, C, D, and E.

Enterocele (Choice B) occurs when the small bowel prolapses against the superior wall of the vagina, with a visible bulge usually present on physical examination. It is not associated with urinary incontinence.

Rectocele (Choice C) is caused by weakness of the pelvic floor, with the rectum prolapsing against the posterior wall of the vagina. Symptoms include constipation and a palpable bulge along the posterior vaginal wall. It does not cause urinary incontinence.

Uterine inversion (Choice D) occurs most frequently during childbirth, specifically during placental delivery when too much traction is applied to the umbilical cord. It can be a significant cause of postpartum hemorrhage in these instances. It rarely occurs spontaneously and does not cause urinary incontinence.

Uterine prolapse (Choice E) refers to the prolapse of the uterus and vagina through the vaginal opening caused by weak pelvic floor musculature. It causes a heavy sensation in the pelvic area, urinary incontinence, and constipation or difficulty initiating a bowel movement. However, the prolapse will be markedly evident on the physical examination.

Educational Objective: A cystocele is caused by weakness of the pelvic floor musculature, most commonly in multiparous patients, that allows the bladder to prolapse against the anterior vaginal wall. This leads to stress incontinence, with the anterior vaginal wall bulge present on physical examination. Management includes physical therapy, pelvic floor pessaries, and surgical correction.

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37. A 1-day-old female newborn is examined in the nursery. She was born at term to a 31-year-old primigravid woman following an uncomplicated spontaneous vaginal delivery. The mother has systemic lupus erythematosus; she was asymptomatic during pregnancy, and her only medication was a prenatal vitamin. The patient's Apgar scores were 9 and 9 at 1 and 5 minutes, respectively. Her temperature is 37°C (98.6°F), pulse is 70/min, respirations are 50/min, and blood pressure is 75/45 mm Hg. Examination shows no abnormalities. An ECG is shown. Which of the following is the most appropriate next step in management?

A) Cardiac catheterization
B) Chemical cardioversion
C) Insertion of a pacemaker
D) Intravenous administration of adenosine
E) Oral administration of digoxin

Correct Answer: C.

Systemic lupus erythematosus is an autoimmune disease with a wide array of presenting symptoms which often include fever, rash, photosensitivity, renal disease, and nonerosive arthritis. When present in pregnant patients, complications can occur for both the mother and fetus. These adverse effects can be caused by the disease itself or by the medications used to treat it. More severe disease, especially lupus nephritis or cardiovascular involvement, carries even higher risks. Complications include miscarriage, preeclampsia, preterm delivery, intrauterine growth restriction, and neonatal lupus. Neonatal lupus is caused by the placental transfer of maternal autoantibodies and can cause heart block in the newborn, as in this patient, as well as cardiomyopathy, aortic dilation, an erythematous rash involving the scalp and periorbital area, photosensitivity, and telangiectasias. Heart block occurs in varying degrees. This patient appears to demonstrate second degree (Mobitz type II) in a 3:1 ratio of conducted to blocked beats. Complete heart block, also called third-degree atrioventricular block, occurs when no sinus impulses are transmitted through the AV

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C) Insertion of a pacemaker

D) Intravenous administration of adenosine

E) Oral administration of digoxin

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Cardiac catheterization (Choice A) is most commonly used to examine the coronary arteries for stenosis in the setting of angina, although it can also be used to determine right-sided filling pressures in the setting of pulmonary hypertension. While cardiac ischemia can cause atrioventricular block, it is a less likely cause of complete heart block than lupus in this newborn.

Chemical cardioversion (Choice B) can be used in the treatment of arrhythmias, particularly atrial fibrillation. It does not play a role in the management of complete heart block.

Intravenous administration of adenosine (Choice D) can be used to treat supraventricular tachyarrhythmias. It works by slowing conduction through the AV node. Since AV nodal conduction is absent in complete heart block, adenosine would play no role in its management.

Oral administration of digoxin (Choice E) can be used to treat supraventricular tachyarrhythmias, such as atrial fibrillation, atrial flutter, and heart failure with reduced ejection fraction. Adverse effects of digoxin include cardiac arrhythmias, such as complete heart block. It plays no role in the management of neonatal heart block.

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Systemic lupus erythematosus is an autoimmune disease with a wide array of presenting symptoms which often include fever, rash, photosensitivity, renal disease, and nonerosive arthritis. When present in pregnant patients, complications can occur for both the mother and fetus. These adverse effects can be caused by the disease itself or by the medications used to treat it. More severe disease, especially lupus nephritis or cardiovascular involvement, carries even higher risks. Complications include miscarriage, preeclampsia, preterm delivery, intrauterine growth restriction, and neonatal lupus. Neonatal lupus is caused by the placental transfer of maternal autoantibodies and can cause heart block in the newborn, as in this patient, as well as cardiomyopathy, aortic dilation, an erythematous rash involving the scalp and periorbital area, photosensitivity, and telangiectasias. Heart block occurs in varying degrees. This patient appears to demonstrate second degree (Mobitz type II) in a 3:1 ratio of conducted to blocked beats. Complete heart block, also called third-degree atrioventricular block, occurs when no sinus impulses are transmitted through the AV conduction pathway resulting in complete dissociation between atrial and ventricular contraction. Ventricular contraction occurs secondary to a junctional rhythm, which can cause bradycardia and decreased cardiac output. Treatment of high grade second-degree, and third-degree block includes the urgent placement of a pacemaker.

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Educational Objective: Neonatal lupus can occur in the setting of maternal systemic lupus erythematosus because of the transfer of maternal autoantibodies to the fetus through the placenta. Manifestations include heart block, cardiomyopathy, aortic dilation, and cutaneous findings, such as an erythematous rash involving the scalp and periorbital area. Management of high-grade heart block includes the placement of a pacemaker.

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38. A 6-month-old boy is brought to the physician because of dry scaly skin for 2 weeks. Over the past 3 months, he has had recurrent episodes of otitis media treated with amoxicillin. There are scattered petechiae over the entire body and mild generalized eczema. Examination shows cervical lymphadenopathy and hepatosplenomegaly. His platelet count is 25,000/mm^3. Which of the following is the most likely diagnosis?

A) Adenosine deaminase deficiency
B) Ataxia-telangiectasia
C) Cellular immunodeficiency with immunoglobulins
D) Chronic mucocutaneous candidiasis
E) Combined immunodeficiency disease
F) Thymic-parathyroid dysplasia (DiGeorge syndrome)
G) Wiskott-Aldrich syndrome

Correct Answer: G.

Wiskott-Aldrich syndrome is caused by a mutation in the WAS gene on the X-chromosome that encodes a protein essential for actin cytoskeleton rearrangement that occurs during interactions between T lymphocytes, antigen-presenting cells, and B lymphocytes, leading to an impaired innate and adaptive immune system. The phenotype is variable but classically includes eczema, thrombocytopenia, and infections with encapsulated bacteria and opportunistic pathogens. Patients may present early with petechiae and bleeding from the umbilicus after separation. Patients are particularly susceptible to infections with *Streptococcus pneumoniae, Neisseria meningitidis*, and *Haemophilus influenzae*, but are also susceptible to a variety of opportunistic pathogens. In addition to recurrent infections, patients are also at an increased risk for autoimmune disease and malignancy, particularly leukemia.

Incorrect Answers: A, B, C, D, E, and F.

Adenosine deaminase deficiency (Choice A) results from autosomal recessive mutations in the ADA gene and is one of several mutations that can lead to the development of severe combined immunodeficiency disease (SCID). It presents with recurrent viral, bacterial, and fungal infections starting at birth, failure to thrive, and severe lymphopenia with impaired cellular and humoral immunity

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Incorrect Answers: A, B, C, D, E, and F.

Adenosine deaminase deficiency (Choice A) results from autosomal recessive mutations in the ADA gene and is one of several mutations that can lead to the development of severe combined immunodeficiency disease (SCID). It presents with recurrent viral, bacterial, and fungal infections starting at birth, failure to thrive, and severe lymphopenia with impaired cellular and humoral immunity.

Ataxia telangiectasia (Choice B) is an autosomal recessive disorder resulting from a DNA repair defect. Consequently, somatic mutations accumulate, leading to protein dysfunction and an increased susceptibility to hematologic malignancy such as Hodgkin lymphoma. Patients typically present with progressive ataxia, telangiectasias, abnormal eye movements, and decreased immunoglobulin concentration (leading to recurrent sinopulmonary infections).

Cellular immunodeficiency with immunoglobulins (Choice C) refers to a number of different immunodeficiency syndromes in which patients lack one or more immunoglobulins. One example is X-linked agammaglobulinemia, which is caused by mutations in the BTK gene that encodes a tyrosine kinase essential for all stages of B lymphocyte development and proliferation. Patients present with recurrent infections and decreased or absent immunoglobulin concentrations.

Chronic mucocutaneous candidiasis (Choice D) is a group of syndromes with various underlying defects. These defects lead to frequent, non-invasive candida infections that are resistant to standard treatments. Patients also have an increased risk for malignancy and autoimmune diseases.

Combined immunodeficiency disease (Choice E) is a broad term that applies to numerous different immunodeficiency syndromes, including Wiskott-Aldrich syndrome, Ataxia-telangiectasia, and DiGeorge syndrome among many others. It is a nonspecific classification.

Thymic-parathyroid dysplasia (DiGeorge syndrome) (Choice F) is caused by a 22q11 deletion that leads to failure of the third and fourth branchial pouches to develop. These structures give rise to the thymus and parathyroid glands, and their absence leads to thymic aplasia and hypocalcemia in cardiac and craniofacial defects. Patients

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Incorrect Answers: A, B, C, D, E, and F.

Adenosine deaminase deficiency (Choice A) results from autosomal recessive mutations in the ADA gene and is one of several mutations that can lead to the development of severe combined immunodeficiency disease (SCID). It presents with recurrent viral, bacterial, and fungal infections starting at birth, failure to thrive, and severe lymphopenia with impaired cellular and humoral immunity.

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Thymic-parathyroid dysplasia (DiGeorge syndrome) (Choice F) is caused by a 22q11 deletion that leads to failure of the third and fourth branchial pouches to develop. These structures give rise to the thymus and parathyroid glands, and their absence leads to thymic aplasia and hypocalcemia in cardiac and craniofacial defects. Patients are susceptible to viral and fungal infections. The definitive diagnosis requires fluorescence in-situ hybridization to detect the missing DNA segment. Treatment is supportive.

Educational Objective: Wiskott-Aldrich syndrome is caused by a mutation in the WAS gene that leads to an immunodeficiency syndrome characterized by recurrent bacterial, fungal, and opportunistic infections in addition to eczema and thrombocytopenia.

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39. A previously healthy 4-year-old boy is brought to the emergency department by his parents 1 day after they noticed that he was not using his left arm. There is no known injury to the arm. He appears comfortable but resists any attempt to move the affected arm because of pain. He holds the left upper extremity with the elbow flexed and the forearm in pronation. There is no evidence of injury. Radial pulses are normal. Sensation is full over the affected extremity. Which of the following is the most appropriate next step in management?

A) Notification of child protective services
B) Supination of the forearm with the elbow in slight flexion
C) X-ray of the left elbow and forearm and skeletal survey
D) X-ray of the left elbow and forearm only
E) Aspiration of the elbow joint for cytology

Correct Answer: B.

Radial head subluxation is a common injury in children and occurs as a result of traction on an extended forearm. Traction results in dislocation of the radial head, allowing the annular ligament to be displaced into the radiohumeral joint space, where it becomes entrapped. Commonly, a child presents after being lifted by the arm, swung by the arms while playing, or held by the arm while pulling away. Children with radial head subluxation typically hold the elbow in semi-flexion and in slight pronation and hold the arm immobile at their side. Physical examination discloses an absence of swelling overlying the joint, deformity, or joint effusion, although children will resist attempts to mobilize the arm. X-ray is not necessary because no fracture is typically present. The joint can be reduced by hyperpronating the forearm, which elicits a palpable click when the annular ligament is returned to its normal position. An alternate technique is supination of the forearm with the elbow in flexion. Patients who cannot be successfully reduced should be evaluated further with plain film x-ray to identify a possible fracture.

Incorrect Answers: A, C, D, and E.

Notification of child protective services (Choice A) is not necessary in children with radial head subluxation, which is a common childhood injury that is not usually suggestive of abuse. However, clinicians should be alert to possible evidence of non-accidental trauma, such as multiple fractures, a history that is inconsistent with observed injuries, or signs of sexual abuse. Clinicians are required to report suspected child abuse to child protective services.

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D) X-ray of the left elbow and forearm only

E) Aspiration of the elbow joint for cytology

Correct Answer: B.

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Incorrect Answers: A, C, D, and E.

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X-rays of the left elbow and forearm (Choice D) are not necessary because no fracture is usually present in the setting of radial head subluxation. X-rays may be helpful if a suspected radial head subluxation cannot be reduced through usual reduction maneuvers. The addition of a skeletal survey (Choice C) is helpful when evaluating for suspected non-accidental trauma but is not necessary for most patients with radial head subluxation.

Aspiration of the elbow joint for cytology (Choice E) is helpful for the diagnosis of septic arthritis. Children with septic arthritis typically appear ill, while the affected joint also displays erythema, swelling, and calor, none of which are present in this patient.

Educational Objective: Radial head subluxation is a common injury in children and occurs as a result of traction on an extended forearm. Traction results in dislocation of the radial head, allowing the annular ligament to be displaced into the radiohumeral joint space, where it becomes entrapped. Techniques for reducing the subluxated radial head include hyperpronation or supination with the elbow in flexion.

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40. A 22-year-old primigravid woman at 15 weeks' gestation comes to the physician for her first prenatal visit. She has no history of serious illness, and pregnancy has been uncomplicated. Examination shows a uterus consistent in size with a 20-week gestation. Ultrasonography shows twins, both male, with a single placenta and no membrane between the fetuses. This patient should be advised that there is an increased risk for which of the following?

A) Conjoined twins
B) Polyhydramnios and oligohydramnios
C) Postmaturity syndrome
D) Umbilical cord entanglement
E) Uterine rupture

Correct Answer: D.

Twin gestations are caused by the splitting of a fertilized ovum (monozygotic twins) or by the fertilization of two ovum by two sperm (dizygotic twins). Monozygotic twins are further classified based on their chorionicity and amnionicity, which are believed consequent to how early in development the zygote divides. Early division is believed to lead to dichorionic/diamniotic twins, intermediate division to monochorionic/diamniotic twins, and later division to monochorionic/monoamniotic twins. There is an increased risk for fetal complications in monoamniotic and monochorionic pregnancies. Monoamniotic pregnancies can be complicated by conjoined twins and cord entanglement, while monochorionic pregnancies can be complicated by twin-twin transfusion syndrome and selective fetal growth restriction. Twin gestations, in general, are more commonly associated with preeclampsia, preterm delivery, fetal growth restriction, and placental abnormalities, such as placenta previa. This patient has monochorionic/monoamniotic twins, raising the risk for cord entanglement, which can result in neurologic sequelae caused by chronic intermittent hypoxemia or fetal demise. Elective cesarean delivery for monochorionic/monoamniotic pregnancies is commonly recommended between 32 and 34 weeks of gestation.

Incorrect Answers: A, B, C, and E.

Conjoined twins (Choice A) can occur in monochorionic/monoamniotic twin pregnancies. However, conjoined twins are usually evident on ultrasonography with contiguous skin, a single umbilical cord, lack of separate fetal movement, or absence of limbs. This patient has two clear fetuses on ultrasonography, making conjoined twins less likely.

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Polyhydramnios and oligohydramnios (Choice B) refer to increased and decreased amniotic fluid volumes, respectively. While this can occur with twin-twin transfusion syndrome in monochorionic/diamniotic pregnancies, both could not occur in this pregnancy as these fetuses share an amniotic sac.

Postmaturity syndrome (Choice C) is caused by the inability of the placenta to continue to support fetal development postterm. Symptoms include oligohydramnios, meconium passage, and a fetus that is small for gestational age with dry, thin skin and absent lanugo hair. Twin gestations are at an increased risk for preterm delivery, not postmaturity syndrome.

Uterine rupture (Choice E) is a dangerous obstetric complication where the uterine wall tears during labor, more commonly in patients that have had a previous cesarean delivery or myomectomy. Acute pain, loss of fetal station, and both maternal and fetal hemodynamic instability are suggestive findings. The likelihood of uterine rupture in a primigravid patient with no previous uterine surgery is less likely than cord entanglement.

Educational Objective: Monozygotic twins are classified based on their chorionicity and amnionicity. Monoamniotic pregnancies may result in conjoined twins or cord entanglement, whereas monochorionic pregnancies may result in twin-twin transfusion syndrome or selective fetal growth restriction.

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41. A 37-year-old primigravid woman at 9 weeks' gestation is admitted to the hospital because of progressive nausea and vomiting. Her symptoms began at 6 weeks' gestation but have worsened so that she can no longer keep food or fluids down. Her temperature is 36.9°C (98.4°F), pulse is 105/min, respirations are 16/min, and blood pressure is 110/60 mm Hg. Examination shows a uterus consistent in size with a 9-week gestation. Her serum thyroid-stimulating hormone concentration is 0.4 μU/mL. Which of the following is the most appropriate next step in management?

A) Measurement of serum prolactin concentration
B) Ultrasonography of the thyroid gland
C) CT scan of the head
D) Intravenous administration of fluids
E) Propylthiouracil therapy

Correct Answer: D.

Severe nausea with the inability to maintain adequate oral intake is a common presenting symptom of hyperemesis gravidarum (HG) and can lead to clinically significant levels of dehydration and starvation ketosis. HG is usually associated with weight loss in early pregnancy and extends past the first trimester, when typical morning sickness resolves. Tachycardia, mild hypotension, and signs of dehydration (eg, dry mucous membranes) would be expected on vital signs and physical examination. Laboratory studies show ketones in the blood and urine, as well as hypoosmolar hyponatremia, and hypokalemic, hypochloremic metabolic alkalosis caused by dehydration and volume contraction. Ketosis can contribute to a secondary metabolic acidosis as well. Since HG is associated with molar pregnancy, it is important to exclude this condition with pelvic ultrasonography and to assess the quantitative concentration of β-human chorionic gonadotropin. Treatment of HG includes the intravenous administration of fluids, vitamin B_6 supplementation, antiemetics, and in severe cases, total parenteral nutrition. When treated appropriately, there are generally no long-term adverse effects on the mother or developing fetus.

Incorrect Answers: A, B, C, and E.

Measurement of serum prolactin concentration (Choice A) can be used to diagnose hyperprolactinemia, which can result in irregular menstrual bleeding or amenorrhea and galactorrhea. Hyperprolactinemia does not cause hyperemesis gravidarum.

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Correct Answer: D.

Severe nausea with the inability to maintain adequate oral intake is a common presenting symptom of hyperemesis gravidarum (HG) and can lead to clinically significant levels of dehydration and starvation ketosis. HG is usually associated with weight loss in early pregnancy and extends past the first trimester, when typical morning sickness resolves. Tachycardia, mild hypotension, and signs of dehydration (eg, dry mucous membranes) would be expected on vital signs and physical examination. Laboratory studies show ketones in the blood and urine, as well as hypoosmolar hyponatremia, and hypokalemic, hypochloremic metabolic alkalosis caused by dehydration and volume contraction. Ketosis can contribute to a secondary metabolic acidosis as well. Since HG is associated with molar pregnancy, it is important to exclude this condition with pelvic ultrasonography and to assess the quantitative concentration of β-human chorionic gonadotropin. Treatment of HG includes the intravenous administration of fluids, vitamin B_6 supplementation, antiemetics, and in severe cases, total parenteral nutrition. When treated appropriately, there are generally no long-term adverse effects on the mother or developing fetus.

Incorrect Answers: A, B, C, and E.

Measurement of serum prolactin concentration (Choice A) can be used to diagnose hyperprolactinemia, which can result in irregular menstrual bleeding or amenorrhea and galactorrhea. Hyperprolactinemia does not cause hyperemesis gravidarum.

Ultrasonography of the thyroid gland (Choice B) can be used for further evaluation of abnormal thyroid function or thyroid nodules, whereas propylthiouracil therapy (Choice E) can be used to treat hyperthyroidism. This patient has a mildly decreased TSH concentration, which is frequently present in pregnant patients because of an increase in serum thyroxine-binding globulin and stimulation of the thyroid-stimulating hormone receptor by human chorionic gonadotropin. She has no other symptoms of hyperthyroidism, making evaluation of her thyroid less pertinent than treating her hypovolemia with intravenous fluids.

CT scan of the head (Choice C) may be used to evaluate any concern for increased intracranial pressure, such as that caused by an intracranial mass, which can lead to intractable nausea and vomiting. While this may be utilized in this patient's evaluation pending the results of her physical examination, intravenous fluid therapy to correct her hypovolemia should be pursued first.

Educational Objective: Hyperemesis gravidarum presents with severe, intractable nausea and vomiting, preventing adequate oral intake in a pregnant patient, which can lead to subsequent dehydration and starvation ketosis. Associated findings include ketonuria and ketonemia, electrolyte derangements, acid/base disturbances, and volume contraction. Treatment consists of intravenous fluid administration, vitamin B_6 supplementation, antiemetics, and possible total parenteral nutrition, if severe.

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42. A 2-month-old boy is brought to the physician for a well-child examination. He was born at term following an uncomplicated pregnancy, labor, and delivery. He has been breast-feeding six to eight times daily since birth. He smiles and lifts his head. He is at the 50th percentile for length, 75th percentile for weight, and 25th percentile for head circumference. Examination shows no abnormalities. His mother asks for nutritional recommendations. Which of the following is the most appropriate recommendation for the infant?

A) Add cow milk-based formula
B) Add pureed fruit
C) Add rice cereal
D) Switch to soy-based formula
E) Begin vitamin C supplementation
F) Begin vitamin D supplementation
G) Begin vitamin K supplementation

Correct Answer: F.

Breast milk meets the full nutritional needs of an infant up to 6 months of age, although infant formula can also be used. After 6 months of age, complementary foods are introduced, which provide further vitamins, energy, and iron supplementation. The introduction of these foods also marks the transition of the infant's diet to the solid food diet of an adult. Initial introduction often includes rice cereal and pureed meats, with the later addition of other pureed foods and then solid foods. For strictly breastfed infants, vitamin D supplementation should be encouraged, as should the supplementation of iron and fluoride after approximately 4 to 6 months of age.

Incorrect Answers: A, B, C, D, E, and G.

Adding cow milk-based formula (Choice A) is incorrect because this patient is receiving adequate nutrition from breast milk based on his appropriate growth. While cow milk-based formulas are frequently used in children, the consumption of unmodified cow's milk should be avoided in infants less than 1 year of age because it can contribute to iron deficiency.

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Correct Answer: F.

Breast milk meets the full nutritional needs of an infant up to 6 months of age, although infant formula can also be used. After 6 months of age, complementary foods are introduced, which provide further vitamins, energy, and iron supplementation. The introduction of these foods also marks the transition of the infant's diet to the solid food diet of an adult. Initial introduction often includes rice cereal and pureed meats, with the later addition of other pureed foods and then solid foods. For strictly breastfed infants, vitamin D supplementation should be encouraged, as should the supplementation of iron and fluoride after approximately 4 to 6 months of age.

Incorrect Answers: A, B, C, D, E, and G.

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Adding pureed fruit (Choice B) or adding rice cereal (Choice C) is incorrect. Pureed foods should not be added to an infant's diet until approximately 6 months of age. Early introduction may lead to aspiration, obesity, or renal solute overload.

Switching to soy-based formula (Choice D) is not necessary because this patient is receiving adequate nutrition from breast milk, based on his appropriate growth. In addition, breastfeeding is associated with a decreased risk for infection (eg, otitis media, gastroenteritis) and reduced incidence of chronic disease, such as obesity and diabetes mellitus.

Beginning vitamin C supplementation (Choice E) is incorrect because vitamin C supplementation is not commonly recommended in infants. However, once pureed and solid foods are introduced, an effort should be made to include foods that are rich in vitamin C.

Beginning vitamin K supplementation (Choice G) is incorrect because vitamin K supplementation is not routinely recommended in infants. Supplementation of fat-soluble vitamins, however, is recommended in infants with fat malabsorption or chronic cholestatic liver disease.

Educational Objective: While breastfeeding can meet the full nutritional needs of an infant for the first 6 months of life, vitamin D supplementation should be encouraged for exclusively breastfed infants. After 6 months of age, pureed foods can also be introduced to the infant's diet, which may supplement vitamins, iron, and energy needs.

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43. A 67-year-old man comes to the physician because of a 6-month history of aching in his thighs and buttocks after he walks 200 feet. His temperature is 37°C (98.6°F), pulse is 80/min, and blood pressure is 140/90 mm Hg. Femoral and distal pulses are absent bilaterally. Serum studies show a urea nitrogen concentration of 30 mg/dL and creatinine concentration of 1.5 mg/dL. He undergoes aortic arteriography. Three days later, his serum creatinine concentration is 2.8 mg/dL. Administration of which of the following prior to the arteriography is most likely to have prevented progression of this patient's renal insufficiency?

A) Dopamine
B) Mannitol
C) Nonsteroidal anti-inflammatory drugs
D) Infusion of 0.9% saline
E) No intervention is likely to have prevented progression of this patient's renal insufficiency

Correct Answer: D.

Infusion of 0.9% saline (normal saline) prior to this patient's aortic arteriography may have prevented his worsening renal function. Contrast induced nephropathy (CIN) usually occurs within 48 hours of patients receiving an intravascular contrast load and is more likely to occur after procedures that use a larger amount of contrast, including aortic arteriography or coronary angiography. The pathogenesis is thought to involve both direct tubular injury and renal vasoconstriction leading to relative hypoxia. It should be noted that this only occurs with the use of iodinated contrast agents. Creatinine increases are typically mild in comparison to other mechanisms of kidney injury, and patients almost never become oliguric. Several studies have demonstrated that the infusion of normal saline in the hours preceding contrast use in patients with underlying renal insufficiency decreases the risk for CIN. This is usually given at a rate of 1 mL/kg/hr for 6 hours prior to and 6 hours after the procedure. Trials comparing normal saline with sodium bicarbonate containing solutions have failed to show any benefit of the latter, so normal saline is typically considered sufficient.

Incorrect Answers: A, B, C, and E.

Dopamine (Choice A) has various physiologic effects depending on the dose administered. It was traditionally used to treat patients with cardiogenic shock, although it has now been mostly supplanted by other vasopressor medications. It has no role in the prevention of CIN.

Mannitol (Choice B) is a hyperosmolar agent that is used to treat patients with increased intracranial or intraocular pressure. It is not used for the prevention or treatment of

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E) No intervention is likely to have prevented progression of this patient's renal insufficiency

Correct Answer: D.

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Dopamine (Choice A) has various physiologic effects depending on the dose administered. It was traditionally used to treat patients with cardiogenic shock, although it has now been mostly supplanted by other vasopressor medications. It has no role in the prevention of CIN.

Mannitol (Choice B) is a hyperosmolar agent that is used to treat patients with increased intracranial or intraocular pressure. It is not used for the prevention or treatment of CIN.

Nonsteroidal anti-inflammatory drugs (Choice C) are generally avoided in patients with underlying renal insufficiency as they can cause renal vasoconstriction. This can worsen any underlying renal insufficiency.

No intervention is likely to have prevented progression of this patient's renal insufficiency (Choice E) is incorrect. Several studies have shown that infusion of normal saline can reduce the incidence of CIN in patients with underlying renal insufficiency.

Educational Objective: CIN is more likely to occur in patients with underlying renal insufficiency who receive iodinated contrast. Creatinine increases are usually mild and occur within 24 to 48 hours, and most patients continue to make urine. Several studies have demonstrated that the infusion of normal saline prior to and following the use of contrast may decrease the incidence of CIN.

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44. A 57-year-old man comes to the physician because of an 8-month history of a nonproductive cough. He has had a 4.5-kg (10-lb) weight gain during the past 6 months despite no change in appetite. He has hypertension treated with atenolol. He has smoked one pack of cigarettes daily for 39 years. He is 175 cm (5 ft 9 in) tall and weighs 98 kg (216 lb); BMI is 32 kg/m^2. His temperature is 37.1°C (98.8°F), pulse is 84/min, respirations are 16/min, and blood pressure is 152/98 mm Hg; one year ago, his blood pressure was 132/78 mm Hg. Examination shows purple striae over the abdomen. His serum potassium concentration is 3.4 mEq/L, and fasting serum glucose concentration is 119 mg/dL. An x-ray of the chest shows a right upper lobe nodule. In addition to a biopsy, which of the following is the most appropriate next step in diagnosis?

A) 24-Hour urine collection for measurement of cortisol concentration
B) Measurement of plasma metanephrine concentration
C) Measurement of serum aldosterone:renin ratio
D) Measurement of serum thyroid-stimulating hormone concentration
E) Renal artery duplex scan

Correct Answer: A.

24-Hour urine collection for measurement of cortisol concentration is the next most appropriate step in evaluation for this patient who has clinical signs and symptoms consistent with Cushing syndrome. Given his smoking history and the presence of a new pulmonary nodule, it is likely that this patient's hypercortisolism is secondary to an ACTH-producing tumor such as small cell carcinoma. ACTH produced by small cell carcinoma stimulates the adrenal gland zona fasciculata to increase the production of cortisol. Hypercortisolism (Cushing syndrome) ensues with its many manifestations, including proximal muscle weakness, osteoporosis, hypertension, hyperglycemia, truncal obesity, moon facies, striae, amenorrhea, and/or immunosuppression. The first step in diagnosis of suspected Cushing syndrome is to confirm a state of excess cortisol production. The gold standard for this is 24-hour urine measurement of cortisol. After hypercortisolism is confirmed, the next step is to measure ACTH. Increased cortisol with a concomitant increase in ACTH suggests either ectopic tumor production of ACTH or Cushing disease (the formation of an ACTH-secreting pituitary adenoma) as the source of hypercortisolism. The two can be distinguished from each other with the use of a high-dose dexamethasone suppression test. If the ACTH is being produced by a structure within the typical endocrine pathway, then it will likely still be inhibited by negative feedback, just at a high dose. If ACTH production is coming from an ectopic site such as a small cell carcinoma, no amount of corticosteroid will cause negative feedback on ACTH production.

Incorrect Answers: B, C, D, and E

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Incorrect Answers: B, C, D, and E.

Measurement of plasma metanephrine concentration (Choice B) is appropriate when pheochromocytoma is suspected. This condition typically presents with episodic hypertension, tachycardia, and anxiety.

Measurement of serum aldosterone:renin ratio (Choice C) is used to evaluate for the presence of primary hyperaldosteronism, which presents with resistant hypertension and sometimes with metabolic alkalosis and hypokalemia.

Measurement of serum thyroid-stimulating hormone concentration (Choice D) is used to assess for hyperthyroidism, which may present with anxiety, weight loss, diaphoresis, and palpitations, or hypothyroidism, which frequently presents with hypertension, cold intolerance, fatigue, and weight gain.

Renal artery duplex scan (Choice E) is used to evaluate for evidence of renal artery stenosis, which can lead to renal insufficiency and resistant hypertension.

Educational Objective: Small cell carcinoma of the lung is a neoplasm of neuroendocrine cells and is associated with numerous paraneoplastic syndromes, including Cushing syndrome caused by ACTH production. Cushing syndrome has many manifestations, including proximal muscle weakness, osteoporosis, hypertension, hyperglycemia, truncal obesity, moon facies, striae, amenorrhea, and/or immunosuppression. Confirmation of hypercortisolism is typically completed using a 24-hour urine collection for measurement of the cortisol concentration, which is expected to be increased.

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45. A 12-year-old boy is brought to the physician because of a 1-year history of recurrent episodes of increased urinary urgency and frequency, increased thirst, and bed wetting. The episodes occur every 3 to 4 weeks and last 2 to 3 days; he does not wet the bed between episodes. He has not had abdominal pain or a burning sensation on urination. He was toilet trained at the age of 3 years and had not wet the bed since the age of 4 years. He has no history of serious illness and takes no medications. His parents divorced 1 year ago; his mother is the custodial parent, and he visits his father on occasional weekends. He is at the 50th percentile for height, at the 95th percentile for weight, and above the 95th percentile for BMI. Genital and pubic hair development are Tanner stage 1. Laboratory studies show:

Serum glucose	85 mg/dL
Urine (first morning void)	
Specific gravity	1.015
Blood	negative
Glucose	negative
Protein	negative

Which of the following is the most likely diagnosis?

A) Diabetes insipidus
B) Primary enuresis
C) Psychogenic polydipsia
D) Type 1 diabetes mellitus
E) Type 2 diabetes mellitus

Correct Answer: C.

Psychogenic polydipsia, or primary polydipsia, refers to a patient's excessive consumption of fluids leading to polyuria and dilute urine (consistent with this patient's low-normal urine specific gravity). Nocturnal enuresis is common. In severe cases, hyponatremia can result. Psychological stress and acute psychosis are risk factors for primary polydipsia. This patient's polydipsia appears to correlate in timing with his parents' divorce and weekends at his father's home. The workup includes a thorough history, serum electrolytes, serum osmolality, a 24-hour urine volume, urine electrolytes, and urine osmolality. Management includes fluid restriction, psychiatric treatment

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C) Psychogenic polydipsia

D) Type 1 diabetes mellitus

E) Type 2 diabetes mellitus

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

In diabetes insipidus (Choice A), a lack of antidiuretic hormone (central) or resistance to antidiuretic hormone (nephrogenic) leads to decreased free water reabsorption from collecting tubules, resulting in polyuria along with a state of dehydration and hypernatremia. The polyuria would be constant rather than episodic. As well, this patient lacks risk factors for diabetes insipidus such as head trauma, heavy metal exposure, or medication exposure.

Primary enuresis (Choice B) refers to nocturnal enuresis that results from children never developing the ability to control their bladder. This patient completed toilet training at age three.

Type 1 and type 2 diabetes mellitus (Choices D and E) may initially present with polydipsia, polyuria, and weight loss. However, the polyuria and polydipsia would be relatively constant rather than episodic. As well, this patient's blood glucose was normal.

Educational Objective: Psychogenic polydipsia, or primary polydipsia, refers to a patient's excessive consumption of fluids leading to polyuria and dilute urine. Psychological stress and acute psychosis are risk factors for primary polydipsia.

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46. A 17-month-old infant with sickle cell disease has a 1-day history of rectal temperatures to 40.6°C (105°F). He has had rhinorrhea and a cough for 3 days. He receives daily penicillin prophylaxis and has received all appropriate immunizations. He is slightly irritable and has clear rhinorrhea. His spleen is palpable 2 cm below the left costal margin. The remainder of the examination is normal. Laboratory studies show:

Hemoglobin	9.8 g/dL
Leukocytes	18,700/mm^3
Segmented neutrophils	65%
Lymphocytes	30%
Bands	3%
Monocytes	2%

Which of the following is the most appropriate pharmacotherapy for this patient?

A) Benzathine penicillin, intramuscularly
B) Ceftriaxone, parenterally
C) Ciprofloxacin, orally
D) A decongestant, orally
E) Erythromycin, orally

Correct Answer: B.

The patient is at risk for serious bacterial infection because of functional asplenia and should be admitted for treatment with a broad-spectrum, parenteral antibiotic such as ceftriaxone. Asplenia can occur as a result of congenital anomalies, trauma, or as a result of chronic thrombosis in sickle cell disease. The spleen plays an important role in the clearance of bacteria, especially encapsulated pathogens such as *Haemophilus influenzae, Neisseria meningitidis, Streptococcus pneumoniae, Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*, among others. It also removes cells infected with intracellular parasites such as *Babesia microti*. Thus, patients lacking a spleen are at risk for infection with parasites and encapsulated bacteria. The spleen functions to remove opsonized bacteria and cells infected with bacteria or parasites both by mechanical filtration in the sinusoids and through phagocytosis by splenic macrophages. Additionally, the spleen is a large lymphatic organ that houses many

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C) Ciprofloxacin, orally

D) A decongestant, orally

E) Erythromycin, orally

Correct Answer: B.

The patient is at risk for serious bacterial infection because of functional asplenia and should be admitted for treatment with a broad-spectrum, parenteral antibiotic such as ceftriaxone. Asplenia can occur as a result of congenital anomalies, trauma, or as a result of chronic thrombosis in sickle cell disease. The spleen plays an important role in the clearance of bacteria, especially encapsulated pathogens such as *Haemophilus influenzae, Neisseria meningitidis, Streptococcus pneumoniae, Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*, among others. It also removes cells infected with intracellular parasites such as *Babesia microti*. Thus, patients lacking a spleen are at risk for infection with parasites and encapsulated bacteria. The spleen functions to remove opsonized bacteria and cells infected with bacteria or parasites both by mechanical filtration in the sinusoids and through phagocytosis by splenic macrophages. Additionally, the spleen is a large lymphatic organ that houses many immunoglobulin-producing B lymphocytes. Any fever or sign of infection in a patient with asplenia should be treated immediately with antibiotics.

Incorrect Answers: A, C, D, and E.

Benzathine penicillin, intramuscularly (Choice A) is not the most appropriate antibiotic choice given its narrow spectrum of activity. Benzathine penicillin is effective in treating β-hemolytic streptococci and *Treponema pallidum*.

Ciprofloxacin, orally (Choice C) would not be recommended as the initial empiric antibiotic choice because of frequent bacterial resistance patterns and decreased bioavailability as compared to parenteral formulations. Similarly, erythromycin, orally (Choice E) may be used once a source of infection and susceptibilities are known but should not be used as an initial empiric agent.

A decongestant, orally (Choice D) may be included for symptomatic relief, but does not replace the need for empiric broad-spectrum, intravenous antibiotics.

Educational Objective: Patients with sickle cell disease often have functional asplenia and are at increased risk for sepsis caused by encapsulated organisms. Fever may be the only initial indication of a severe bacterial infection, and patients should be treated with a broad-spectrum, intravenous antibiotic empirically.

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47. A 32-year-old primigravid woman at 27 weeks' gestation is brought to the emergency department because of painless vaginal bleeding for 6 hours. She has to change sanitary pads every 2 hours. She has had no prenatal care. Ultrasonography at 16 weeks' gestation showed a normal fetus and a posterior fundal placenta. Her pulse is 100/min, and blood pressure is 120/80 mm Hg. Pelvic examination shows normal external genitalia. The uterus measures 27 cm and is nontender. Speculum examination shows a 2-cm friable ulcer on the cervix. The cervix is long, the external os is 1 cm dilated, and the internal os is closed. Which of the following is the most likely cause of the bleeding?

A) Cervical cancer
B) Cervical condylomata acuminata
C) Endocervical polyp
D) Hydatidiform mole
E) Placenta previa
F) Premature labor
G) Spontaneous abortion

Correct Answer: A.

A friable, ulcerative lesion on the cervix is concerning for cervical cancer, which in about 70% of cases is squamous cell carcinoma derived from the epithelial lining of the ectocervix. Cervical squamous cell carcinoma begins from the transformation zone or squamocolumnar junction, which demarcates the ectocervix and its squamous epithelium from the endocervix and its columnar epithelium. It is the target region of a Pap smear, a screening test for cervical neoplasia. Risk factors for cervical cancer include human papillomavirus (HPV) high risk strain 16, 18, 31, or 33 infections, early age at onset of sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections. Cervical cancer classically presents with painless vaginal bleeding, with or without intercourse. It may locally invade into the bladder or rectum if advanced and can result in hydronephrosis by obstructing the distal ureteral insertions to the bladder. If distant spread occurs, the lung is a common site of metastatic disease.

Incorrect Answers: B, C, D, E, F, and G.

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G) Spontaneous abortion

Correct Answer: A.

A friable, ulcerative lesion on the cervix is concerning for cervical cancer, which in about 70% of cases is squamous cell carcinoma derived from the epithelial lining of the ectocervix. Cervical squamous cell carcinoma begins from the transformation zone or squamocolumnar junction, which demarcates the ectocervix and its squamous epithelium from the endocervix and its columnar epithelium. It is the target region of a Pap smear, a screening test for cervical neoplasia. Risk factors for cervical cancer include human papillomavirus (HPV) high risk strain 16, 18, 31, or 33 infections, early age at onset of sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections. Cervical cancer classically presents with painless vaginal bleeding, with or without intercourse. It may locally invade into the bladder or rectum if advanced and can result in hydronephrosis by obstructing the distal ureteral insertions to the bladder. If distant spread occurs, the lung is a common site of metastatic disease.

Incorrect Answers: B, C, D, E, F, and G.

Cervical condylomata acuminata (Choice B) are genital warts associated with human papillomavirus and can appear on the penis, vagina, vulva, and/or anal canal. They present as soft, fleshy growths, and patients with HIV are prone to severe lesions. They are generally not ulcerations.

Endocervical polyps (Choice C) may cause uterine bleeding that is irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). However, it would be evident on ultrasonography of the uterus and would not cause a friable ulcer on the cervix.

Hydatidiform moles (Choice D) commonly present with persistent nausea and vomiting, first trimester vaginal bleeding, early preeclampsia, and uterine size out of proportion to the expected gestational age. Pelvic examination may reveal cystic clusters in the vagina. Serum β-hCG will be markedly increased, and ultrasonography will demonstrate diffuse echogenic structures within the endometrial cavity along with ovarian theca-lutein cysts, which are not present in this patient.

Placenta previa (Choice E) is an abnormal positioning of placental tissue such that the placenta partially or entirely overlies the internal cervical os. Placenta previa is usually detected on routine prenatal ultrasonography. Its most common presenting symptom is third trimester painless vaginal bleeding, but it would not cause a cervical lesion.

Premature labor (Choice F) is defined as labor (regular contractions plus cervical change) occurring after 20 and prior to 37 weeks of gestation. The risk to fetal survival is greater the earlier preterm labor occurs. However, it more commonly presents with abdominal contractions or rupture of membranes rather than with painless vaginal bleeding.

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Incorrect Answers: B, C, D, E, F, and G.

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Spontaneous abortion (Choice G) describes the noninduced loss of a fetus prior to 20 weeks of gestation. It presents with acute vaginal bleeding and cramping. There are various stages of spontaneous abortion depending on the presence or absence of a fetal heartbeat, whether the cervical os is open or closed, and the extent of fetal passage through the cervix. However, this patient is at 20 weeks of gestation, previously demonstrated a normal fetus on ultrasonography, and has a friable ulcer on pelvic examination, making cervical cancer a more likely diagnosis.

Educational Objective: Cervical cancer commonly presents with painless vaginal bleeding, and physical examination may reveal a friable, ulcerative, or exophytic lesion on the cervix. Risk factors include HPV infection (high-risk strains 16, 18, 31, and 33), early sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections.

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48. A 1-week-old boy is brought to the physician because of a 2-day history of fever and irritability. His temperature is 39°C (102.2°F). Examination shows decreased motion of the left hip with tenderness. An x-ray of the hip shows increased joint space. Aspiration of the hip joint yields 3 mL of purulent fluid. A culture of the fluid is most likely to grow which of the following organisms?

A) *Haemophilus influenzae* type b
B) *Listeria monocytogenes*
C) *Neisseria gonorrhoeae*
D) *Shigella boydii*
E) *Staphylococcus aureus*

Correct Answer: E.

Septic arthritis classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. It may occur in children, including infants and neonates, in whom it may present with more subtle joint findings in comparison to older children and adults. Septic arthritis results from a bacterial infection of the synovial joint space. In neonates and infants, the most commonly implicated organism remains *Staphylococcus aureus*, however, there is a higher incidence of infection with other organisms, such as *Neisseria gonorrhoeae, Haemophilus influenzae* type b, and gram-negative enteric bacteria. Examination of the affected joint typically discloses pain on passive range of motion, swelling, and erythema. Arthrocentesis is indicated for the evaluation of monoarticular erythema and swelling to evaluate for septic arthritis, which characteristically shows purulent (neutrophilic predominant) synovial fluid with greater than 50,000 leukocytes/mm^3. Serum studies may also show leukocytosis and increased inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Treatment involves urgent intravenous antibiotics and source control, with patients often requiring irrigation of the joint in the operating room.

Incorrect Answers: A, B, C, and D.

Haemophilus influenzae type b (Choice A) and *Neisseria gonorrhoeae* (Choice C) are both more common causes of septic arthritis in neonates and infants in comparison to older children or adults. However, infection with these organisms remains less common than with *S. aureus*. Septic arthritis caused by *N. gonorrhoeae* is often accompanied by pustular skin lesions.

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D) *Shigella boydii*

E) *Staphylococcus aureus*

Correct Answer: E.

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Listeria monocytogenes (Choice B) is a gram-positive bacillus that may cause bacterial meningitis in infants and elderly adults and exhibits characteristic tumbling motility on light microscopy. It is not a common cause of septic arthritis.

Shigella boydii (Choice D) is a gram-negative bacillus that is a cause of dysentery. Infection with *S. boydii* may be a precipitating event for reactive arthritis, but it is not a common cause of septic arthritis.

Educational Objective: Septic arthritis results from bacterial infection of the joint space and classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. In both adults and children, the most common causative organism is *Staphylococcus aureus*.

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49. A 27-year-old man with schizophrenia is brought to the emergency department by his mother because he says he has been unable to see anything for the past 3 hours. They have been on a car trip across the country for the past 6 days. Last night, he reported hearing voices, so they stopped in an emergency department by the highway; he was administered haloperidol and was released 1 hour later. He has no other history of serious illness. His only regularly scheduled medication is intramuscular fluphenazine every 3 weeks. His temperature is 37.1°C (98.8°F), pulse is 88/min, and blood pressure is 142/78 mm Hg. On examination, he is lying on a stretcher, moaning, with his upper extremities held rigidly to his side. The eyes are rotated superiorly. The neck is rigid. On mental status examination, he is alert but too distressed to answer questions. His leukocyte count is 9800/mm^3. Which of the following is the most likely cause of this patient's current visual problems?

A) Adverse effect of haloperidol
B) Factitious disorder
C) Hallucination related to his schizophrenia
D) Meningitis
E) Neuroleptic malignant syndrome

Correct Answer: A.

Acute dystonic reactions are involuntary, painful muscle spasms that occur most frequently in response to potent dopamine-2 (D_2) antagonists such as high-potency typical antipsychotics (eg, haloperidol, fluphenazine). Common presentations include torticollis (head tilted to the side and down), retrocollis (head tilted back), opisthotonos (arching of the back), and oculogyric crisis (deviation of the eyes). Patients rarely present with laryngospasm and stridor. The underlying pathophysiology is an imbalance in the dopaminergic-cholinergic pathways of the basal ganglia. Risk factors for development include male sex, young age, recent cocaine use, and a history of previous acute dystonic reaction. Acute dystonic reactions are treated with diphenhydramine or benztropine, which are both anticholinergic medications that work to restore the proper balance in the dopaminergic and cholinergic pathways. Neuroleptic malignant syndrome is a life-threatening differential diagnosis that should be excluded.

Incorrect Answers: B, C, D, and E.

In factitious disorder (Choice B), patients consciously produce symptoms (eg, purposely injure themselves) for primary gain. Diagnosis is supported by inconsistencies in

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Incorrect Answers: B, C, D, and E.

In factitious disorder (Choice B), patients consciously produce symptoms (eg, purposely injure themselves) for primary gain. Diagnosis is supported by inconsistencies in the history or physical examination and a history of extensive clinical evaluations. This patient's recent history of haloperidol use and muscle spasms are consistent with acute dystonic reaction.

Hallucinations related to his schizophrenia (Choice C) do not typically present with muscle stiffness or constant deviation of the eyes. Though a patient may turn to look at a visual hallucination, his eyes would still track external stimuli. As well, auditory hallucinations are more common than visual hallucinations in patients with schizophrenia.

Meningitis (Choice D) presents acutely with fever, nuchal rigidity, and altered mental status in a toxic-appearing patient. This patient does not have a fever or altered mental status, and muscle spasms are more consistent with acute dystonic reaction.

Neuroleptic malignant syndrome (Choice E) is a life-threatening condition associated with the antagonism of dopamine that presents with altered mental status, muscle rigidity, hyperthermia, and autonomic dysfunction. Characteristic laboratory abnormalities include leukocytosis and increased serum creatine kinase, lactate dehydrogenase, and alkaline phosphatase. This patient does not have leukocytosis, hyperthermia, altered mental status, or significant autonomic dysfunction other than mild hypertension that is likely a pain response.

Educational Objective: An acute dystonic reaction most commonly occurs in response to typical antipsychotics and presents with torticollis, retrocollis, opisthotonos, and/or oculogyric crisis. Treatment involves anticholinergic medications, such as diphenhydramine or benztropine, which restore the dopaminergic-cholinergic balance in the basal ganglia.

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50. A 32-year-old man comes to the physician with his wife because of changes in his behavior during the past 2 weeks. Four weeks ago, he witnessed a close friend die in a motor vehicle collision. On the evening of the collision, the patient had offered to drive his friend home after they had had a few beers, but the friend declined. As the friend walked away from the patient's car, he was struck by an oncoming vehicle. The patient states that he does not remember much about the incident. During the past 2 weeks, his wife reports that he has been awakening nightly in a sweat and shouting "Watch out!" She states that he has been more emotionally distant and that he has not wanted to socialize with friends. He has not driven his car for 10 days. The patient reports difficulty sleeping and concentrating and says that "things just don't seem real at times." He says he used to drink alcohol only rarely but has been drinking two beers nightly for 3 weeks to help him calm his mind and sleep. His temperature is 36.9°C (98.4°F), pulse is 82/min, respirations are 12/min, and blood pressure is 145/80 mm Hg. Physical examination shows no abnormalities. On mental status examination, he has a flat affect but is irritable. He says that he has not been feeling much of anything lately. He has thought about death frequently during the past 2 weeks but says he does not want to commit suicide. Results of laboratory studies are within the reference range. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Adjustment disorder
C) Bereavement
D) Dissociative identity disorder
E) Major depressive disorder
F) Panic disorder
G) Substance-induced mood disorder

Correct Answer: A.

Acute stress disorder presents with intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma (eg, avoidance of driving in this patient), and negative changes in mood/thoughts that occur within 1 month of a traumatic event. The inciting traumatic event is defined as a serious physically or sexually violent experience or the in-person observation of this experience happening to another person. Intrusive memories may manifest as daytime flashbacks or nightmares. Changes in arousal and reactivity may manifest as hypervigilance, sleep disturbances, impaired concentration, and/or irritable outbursts. Negative changes in mood and cognitions may include shame, diminished interest in activities, exaggerated negative beliefs about the self or the world, feelings of detachment, an inability to remember

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D) Dissociative identity disorder

E) Major depressive disorder

F) Panic disorder

G) Substance-induced mood disorder

Correct Answer: A.

Acute stress disorder presents with intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma (eg, avoidance of driving in this patient), and negative changes in mood/thoughts that occur within 1 month of a traumatic event. The inciting traumatic event is defined as a serious physically or sexually violent experience or the in-person observation of this experience happening to another person. Intrusive memories may manifest as daytime flashbacks or nightmares. Changes in arousal and reactivity may manifest as hypervigilance, sleep disturbances, impaired concentration, and/or irritable outbursts. Negative changes in mood and cognitions may include shame, diminished interest in activities, exaggerated negative beliefs about the self or the world, feelings of detachment, an inability to remember details of the incident, and/or derealization. This patient's increased alcohol consumption may represent an attempt to avoid reminders of the trauma. Treatment includes trauma-focused cognitive-behavioral therapy rather than medication.

Incorrect Answers: B, C, D, E, F, and G.

Adjustment disorder (Choice B) refers to the onset of disproportionate distress within 3 months of an identifiable stressor with associated anxiety, depression, or conduct disturbances. By definition, since this patient's symptoms are consistent with the more specific diagnosis of acute stress disorder, he does not meet adjustment disorder criteria.

Bereavement (Choice C), or uncomplicated grief reaction, refers to a person's emotional response after a loved one dies and can include sadness, shock, anguish, guilt, regret, difficulty concentrating, decreased interest in usual activities, preoccupation with thoughts and memories of the deceased, and neurovegetative symptoms such as sleep, appetite, and energy disturbances. This patient's intrusive memories and avoidance behaviors are specific to the violent incident rather than memories of the deceased.

Dissociative identity disorder (Choice D), formerly known as multiple personality disorder, refers to patients transitioning between several identities and is frequently related to childhood trauma. This patient does not demonstrate distinct personalities.

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Incorrect Answers: B, C, D, E, F, and G.

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Dissociative identity disorder (Choice D), formerly known as multiple personality disorder, refers to patients transitioning between several identities and is frequently related to childhood trauma. This patient does not demonstrate distinct personalities.

Major depressive disorder (Choice E) includes 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). This patient does not meet the symptom criteria for major depressive disorder, and his concentration impairment, sleep disturbance, and anhedonia are related to the traumatic event.

Panic disorder (Choice F) is characterized by recurrent panic attacks that are unexpected (occur without a clear trigger). Panic attacks present with intense anxiety and the presence of at least four other symptoms (eg, signs of sympathetic activation such as diaphoresis, palpitations, and dyspnea). This patient's sympathetic activation occurs in the setting of nightmares about the traumatic event. As well, he does not experience the required number of panic symptoms to meet criteria.

Substance-induced mood disorder (Choice G) refers to a mood disturbance that developed during or within a month of intoxication or withdrawal from a substance. Though alcohol use can lead to depressed mood, this patient's intrusive memories and avoidance behaviors are specific to the violent incident, indicating that his changes in mood are likely related to the trauma as well.

Educational Objective: Acute stress disorder refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity, avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence.

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1. A 67-year-old man is brought to the emergency department because of a 6-week history of moderate pain in his legs when walking. He says the pain begins after he walks approximately 50 feet; it improves if he stops walking but returns when he tries to move again. He says the pain is worse in his right leg. He has hypertension and hyperlipidemia. His medications are lisinopril, amlodipine, metoprolol, and atorvastatin. He has smoked two packs of cigarettes daily for 40 years. He appears in no acute distress. He is 180 cm (5 ft 11 in) tall and weighs 107 kg (235 lb); BMI is 33 kg/m^2. His blood pressure is 150/86 mm Hg. Examination shows sparse hair from 6 cm above the foot to the dorsum of the foot bilaterally. Lower extremity pulses are 1+. At this time, it is most appropriate to evaluate this patient for which of the following conditions?

A) Abdominal aortic aneurysm
B) Carotid artery stenosis
C) Deep venous thrombosis
D) Peripheral neuropathy
E) Venous insufficiency

Correct Answer: A.

The patient's findings are concerning for atherosclerotic cardiovascular disease given the presence of significant risk factors, claudication, and distal extremity hair loss suggestive of significant peripheral artery disease. In addition to continuing his pharmacologic regimen, controlling hypertension, and counseling on weight management and tobacco cessation, the patient should be evaluated for an abdominal aortic aneurysm (AAA) at this time. Abdominal aortic aneurysms are most commonly seen in male smokers with a positive family history, and a history of atherosclerotic disease. Other risk factors include hypercholesterolemia, hypertension, and trauma. They commonly occur in the infrarenal abdominal aorta and may present as a palpable, pulsatile abdominal mass if large and in a thin patient. Ruptured aneurysms require emergent surgical intervention and repair. Chronic aneurysms are typically asymptomatic. The US Preventive Services Task Force (USPSTF) recommends using ultrasonography to screen for AAA in men aged 65 to 75 years who have a history of tobacco use.

Incorrect Answers: B, C, D, and E.

Carotid artery stenosis (Choice B) refers to atherosclerotic disease of the extracranial carotid arteries. The USPSTF does not recommend routine screening for carotid

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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Carotid artery stenosis (Choice B) refers to atherosclerotic disease of the extracranial carotid arteries. The USPSTF does not recommend routine screening for carotid artery stenosis in asymptomatic patients. Patients with a history of ischemic stroke, transient ischemic attack, or neurologic symptoms referable to the carotid arteries should receive a diagnostic evaluation.

Deep venous thrombosis (Choice C) commonly occurs in the lower extremities after surgery, during periods of immobilization, and in patients with increased inflammatory states such as cancer. Although this would present with acute pain in the extremity with associated swelling.

Peripheral neuropathy (Choice D) is a less likely finding at this time because his symptoms are more consistent with a vascular, rather than neurogenic, origin. Diabetes mellitus is a common comorbidity in the setting of obesity, hypertension, and cardiovascular disease, and the patient should be screened. If present, regular screening for microvascular complications such as peripheral neuropathy is recommended, typically using monofilament testing.

Venous insufficiency (Choice E) can also cause distal extremity hair loss, though this is most often caused by significant edema. Typically, skin hyperpigmentation, swelling, and varicose veins are observed as well.

Educational Objective: The US Preventive Services Task Force (USPSTF) recommends screening for abdominal aortic aneurysms in men aged 65 to 75 years who have a history of tobacco use.

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2. A 52-year-old man comes to the physician 2 weeks after he noted yellowing of his skin, which has since resolved spontaneously. He has hypertension and osteoarthritis. His medications are hydrochlorothiazide and tramadol. He uses intravenous heroin weekly; his last injection was 2 days ago. He is 175 cm (5 ft 9 in) tall and weighs 79 kg (175 lb); BMI is 26 kg/m^2. His temperature is 37°C (98.6°F), pulse is 78/min, respirations are 12/min, and blood pressure is 148/92 mm Hg. Examination shows no abnormalities. Serum studies show:

Bilirubin	2.4 mg/dL
Alkaline phosphatase	118 U/L
AST	250 U/L
ALT	300 U/L
Hepatitis A antibody	negative
HBsAg	negative
HBsAb	negative
Anti-HCV	negative

Which of the following is most likely to confirm the diagnosis?

A) Anticentromere antibody testing
B) Anti-HBc IgM testing
C) Anti-smooth muscle antibody test
D) Determination of serum transferrin saturation
E) Serum antinuclear antibody assay

Correct Answer: B.

The patient is presenting with acute hepatitis with jaundice, hyperbilirubinemia, and increased serum liver enzyme concentrations. Causes of acute hepatitis include viral infections, alcohol, medications or supplements, autoimmune disease, and ischemic injury. Intravenous drug use is a major risk factor for viral hepatitis, especially transmission of hepatitis B virus (HBV) and hepatitis C virus (HCV). Serologic testing for acute viral hepatitis includes anti-hepatitis A virus (HAV) IgM and IgG antibodies

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Incorrect Answers: A, C, D, and E.

Anticentromere antibody testing (Choice A) has a high specificity for limited systemic sclerosis (CREST syndrome), which typically presents with taut, hardened skin of the distal extremities, Raynaud phenomenon, calcinosis, telangiectasias, and esophageal dysmotility.

Anti-smooth muscle antibody test (Choice C) is specific for autoimmune hepatitis, which can range from asymptomatic to fulminant hepatitis; typically, the presentation includes chronic nonspecific symptoms such as fatigue, weight loss, jaundice, nausea, vomiting, pruritis, and right upper quadrant abdominal discomfort. The risk factor of intravenous drug use increases the likelihood of viral hepatitis as the cause of this patient's symptoms.

Determination of serum transferrin saturation (Choice D), along with other iron studies, is useful in evaluating for hereditary hemochromatosis; specific genetic testing may follow if indicated. Clinical manifestations typically include hepatic and cardiac dysfunction caused by iron deposition and organ toxicity, as well as diabetes mellitus and

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Serum antinuclear antibody assay (Choice E) is increased in many autoimmune diseases. It is classically a sensitive test for systemic lupus erythematosus and Sjogren syndrome. Cutaneous manifestations of systemic lupus erythematosus can include photosensitive dermatitis, discoid rash, and oral ulcers. Viral hepatitis is a more common cause of jaundice and acute hepatic injury.

Educational Objective: Risk factors for acute hepatitis B infection include intravenous drug use, unprotected sexual contact, blood exposure (eg, needle-stick injuries, blood transfusions), and perinatal transmission. Anti-HBc IgM may be the only positive serologic assay in the initial window phase of acute infection.

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3. A 52-year-old man comes to the physician because of a 3-month history of increasing difficulty with swallowing. He first noted difficulty swallowing solids; during the past 3 weeks, he has had difficulty swallowing fluids. He has had an 18-kg (40-lb) weight loss during this time. He has not had heartburn or nasal regurgitation of fluids. He has no history of serious illness and takes no medications. He has smoked one and one-half packs of cigarettes daily for 34 years and drinks 16 oz of vodka three times weekly. The patient is 180 cm (5 ft 11 in) tall and weighs 68 kg (150 lb); BMI is 21 kg/m^2. He appears cachetic. Examination shows no other abnormalities. A percutaneous endoscopic gastrostomy tube is placed, and enteral nutrition is begun. During the next 36 hours, this patient is at increased risk for which of the following laboratory abnormalities?

A) Hyperkalemia
B) Hypernatremia
C) Hyperphosphatemia
D) Hyponatremia
E) Hypophosphatemia

Correct Answer: E.

Patients who are chronically malnourished are at increased risk for refeeding syndrome on the reinstitution of proper nutrition. The metabolic changes that occur in the setting of abrupt resumption of caloric and nutritional intake are mediated primarily by a rise in insulin and include increases in the synthesis of protein, fat, and glycogen. These anabolic processes require the use of a variety of electrolytes, especially phosphorus, and may result in hypophosphatemia. Patients may also less frequently experience hypokalemia and hypomagnesemia. These electrolyte derangements may result in potentially fatal complications, such as acute heart failure, respiratory failure, cardiac arrhythmia, or seizures. Refeeding syndrome typically occurs within one to 2 weeks of the resumption of feeding. Refeeding syndrome may be prevented by a slow, deliberate increase in the caloric intake, as well as careful monitoring of electrolytes.

Incorrect Answers: A, B, C, and D.

Hyperkalemia (Choice A) is not expected in the setting of refeeding syndrome. Increased insulin concentrations on the initiation of feeding results in an intracellular shift of potassium with resultant hypokalemia, rather than hyperkalemia.

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C) Hyperphosphatemia

D) Hyponatremia

E) Hypophosphatemia

Correct Answer: E.

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Hypernatremia (Choice B) or hyponatremia (Choice D) may occur in refeeding syndrome secondary to insulin-mediated renal sodium and water retention. Neither finding is observed as frequently as hypophosphatemia.

Hyperphosphatemia (Choice C) is not typically observed in this setting. Chronically malnourished patients are usually hypophosphatemic, a condition which is exacerbated by the increased anabolism that occurs during refeeding. Insulin leads to increased cellular uptake of phosphorus, and similarly most anabolic processes consume phosphorus. In combination, these factors create an increased risk for hypophosphatemia, rather than hyperphosphatemia.

Educational Objective: Refeeding syndrome may occur in chronically malnourished patients on the reinstitution of proper nutrition. Insulin-mediated anabolic processes result in a variety of electrolyte changes, especially hypophosphatemia, which is the hallmark of refeeding syndrome. Carefully increasing the patient's caloric intake and monitoring electrolytes is essential to prevent refeeding syndrome and its potentially fatal complications.

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4. A 19-year-old woman with celiac disease comes to the physician because of a 3-month history of daily diffuse aching in her arms and legs. She has not had weakness or numbness. She continues to have diarrhea approximately 3 days weekly. She tries to avoid eating gluten but has found it difficult to maintain an entirely gluten-free diet. Her medications are ferrous sulfate and an oral contraceptive. Her last examination was 2 years ago. She appears tired. She is 170 cm (5 ft 7 in) tall and weighs 54 kg (120 lb); BMI is 19 kg/m^2. Her pulse is 67/min, and blood pressure is 105/72 mm Hg. The abdomen is soft, mildly tender, and nondistended; there is no rebound, guarding, or masses. There is mild weakness of the hip flexors and extensors. Serum studies show:

Na^+	137 mEq/L
K^+	3.9 mEq/L
Cl^-	105 mEq/L
HCO_3^-	22 mEq/L
Ca^{2+}	8.4 mg/dL
Urea nitrogen	20 mg/dL
Creatinine	0.8 mg/dL
Phosphorus	2.7 mg/dL
Alkaline phosphatase	175 U/L
Parathyroid hormone, intact	870 pg/mL
25-Hydroxyvitamin D	7 ng/mL (N>20 ng/mL)

Which of the following is the most likely diagnosis?

A) Hereditary hypophosphatemic rickets
B) 1α-Hydroxylase deficiency
C) Osteodystrophy
D) Osteomalacia
E) Primary hyperparathyroidism

Correct Answer: D

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Which of the following is the most likely diagnosis?

A) Hereditary hypophosphatemic rickets
B) 1α-Hydroxylase deficiency
C) Osteodystrophy
D) Osteomalacia
E) Primary hyperparathyroidism

Correct Answer: D.

Celiac disease is a gluten-sensitive enteropathy that is mediated by immune intolerance of the protein gliadin, commonly found in wheat products. This results in inflammatory infiltration of the proximal small bowel, which leads to characteristic intraepithelial lymphocytosis, villous atrophy, and crypt hyperplasia. Malabsorption of substances in the proximal small bowel ensues, which presents symptomatically as chronic diarrhea, steatorrhea, and nutritional deficiencies. Malabsorption often results in the impaired absorption of vitamin D, leading to hypocalcemia and secondary osteomalacia. Patients may also develop a secondary hyperparathyroidism and hypophosphatemia in an attempt to compensate for poor gastrointestinal calcium absorption. Dual-energy x-ray absorptiometry (DEXA) scanning can be useful for assessing bone density in patients with celiac disease who are at risk for osteomalacia. Calcium absorption and bone mineral density typically improve after beginning a gluten-free diet.

Incorrect Answers: A, B, C, and E.

Hereditary hypophosphatemic rickets (Choice A) is caused by an inherited inability of the renal proximal tubule to reabsorb phosphate and presents similarly to vitamin D-deficient rickets. It is typically inherited in an X-linked dominant manner. It is a rare disease and is a less likely cause of hypocalcemia in this patient with celiac disease.

1α-Hydroxylase deficiency (Choice B) causes vitamin D dependent rickets because of the impaired conversion of 25-hydroxyvitamin D_3 to 1,25-dihydroxyvitamin D_3. Similar to hereditary hypophosphatemic rickets, 1α-hydroxylase deficiency is rare and is a less likely cause of hypocalcemia in this patient with celiac disease.

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Incorrect Answers: A, B, C, and E.

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1α-Hydroxylase deficiency (Choice B) causes vitamin D dependent rickets because of the impaired conversion of 25-hydroxyvitamin D_3 to 1,25-dihydroxyvitamin D_3. Similar to hereditary hypophosphatemic rickets, 1α-hydroxylase deficiency is rare and is a less likely cause of hypocalcemia in this patient with celiac disease.

Osteodystrophy (Choice C), particularly Albright hereditary osteodystrophy, may lead to pseudohypoparathyroidism, caused by an impaired response of the kidney to parathyroid hormone, which results in hypocalcemia. It is commonly associated with short stature, developmental delay, round facies, and brachydactyly.

Primary hyperparathyroidism (Choice E) results in hypercalcemia, hypophosphatemia, subperiosteal bone resorption, and renal failure. Primary hyperparathyroidism is commonly caused by a parathyroid adenoma, followed by parathyroid hyperplasia and parathyroid carcinoma. Primary hyperparathyroidism is not typically accompanied by vitamin D deficiency (although it may be in some cases). The presence of vitamin D deficiency is more suggestive of hyperparathyroidism secondary to impaired calcium absorption.

Educational Objective: Celiac disease is characterized by malabsorption in the proximal small bowel, which presents symptomatically as chronic diarrhea, steatorrhea, and nutritional deficiencies. Malabsorption often results in the impaired absorption of vitamin D, leading to hypocalcemia and secondary osteomalacia. Calcium absorption and bone mineral density typically improve after beginning a gluten-free diet.

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5. A 57-year-old woman comes to the emergency department because of a 6-month history of productive cough that has worsened during the past week. During the past 6 weeks, she also has had progressive shortness of breath, fatigue, and sputum production. She has had four episodes of pneumonia during the past 3 years. She takes no medications. She appears ill. Her temperature is 38.4°C (101°F), pulse is 96/min, and respirations are 22/min. Diffuse crackles and rhonchi are heard bilaterally. The remainder of the examination shows no abnormalities. A chest x-ray shows linear atelectasis and dilated and thickened airways. Which of the following is the most appropriate next step in management?

A) Chest physical therapy
B) High-frequency chest wall compression
C) Inhaled administration of antibiotics
D) Inhaled administration of dornase alfa
E) Intravenous administration of antibiotics
F) Intravenous administration of corticosteroids

Correct Answer: E.

The patient has bronchiectasis identified on her chest x-ray. Bronchiectasis refers to chronic dilation and distortion of the bronchi and/or bronchioles and can progress to a condition similar to chronic obstructive pulmonary disease with chronic airway inflammation and obstruction to flow punctuated by acute flares. In adults, diagnosis is supported by the presence of chronic cough with increased sputum production, frequent exacerbations, and thickened, dilated airways observed on chest imaging. Chest imaging may also show linear atelectasis or scarring, and peripheral opacities related to multifocal mucous plugs. There are numerous causes that can contribute to development, including cigarette smoking, recurrent pneumonia, recurrent micro-aspiration (as in the setting of acid reflux), and allergic bronchopulmonary aspergillosis. Congenital conditions such as cystic fibrosis, primary ciliary dyskinesia, and immunodeficiency disorders are commonly associated with bronchiectasis. Acute exacerbations are most commonly associated with infection, and antibiotic therapy is the mainstay of treatment. This patient should be admitted for intravenous administration of antibiotics given the severity of her presentation. Antiviral therapy targeting influenza is often included when seasonally appropriate.

Incorrect Answers: A, B, C, D, and F.

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E) Intravenous administration of antibiotics

F) Intravenous administration of corticosteroids

Correct Answer: E.

The patient has bronchiectasis identified on her chest x-ray. Bronchiectasis refers to chronic dilation and distortion of the bronchi and/or bronchioles and can progress to a condition similar to chronic obstructive pulmonary disease with chronic airway inflammation and obstruction to flow punctuated by acute flares. In adults, diagnosis is supported by the presence of chronic cough with increased sputum production, frequent exacerbations, and thickened, dilated airways observed on chest imaging. Chest imaging may also show linear atelectasis or scarring, and peripheral opacities related to multifocal mucous plugs. There are numerous causes that can contribute to development, including cigarette smoking, recurrent pneumonia, recurrent micro-aspiration (as in the setting of acid reflux), and allergic bronchopulmonary aspergillosis. Congenital conditions such as cystic fibrosis, primary ciliary dyskinesia, and immunodeficiency disorders are commonly associated with bronchiectasis. Acute exacerbations are most commonly associated with infection, and antibiotic therapy is the mainstay of treatment. This patient should be admitted for intravenous administration of antibiotics given the severity of her presentation. Antiviral therapy targeting influenza is often included when seasonally appropriate.

Incorrect Answers: A, B, C, D, and F.

Chest physical therapy (Choice A), which often includes high-frequency chest wall compression (Choice B), is commonly utilized to assist patients who have decreased ability to clear mucus from the airways, which may be caused by neuromuscular weakness, ciliary dyskinesia, or congenital conditions such as cystic fibrosis associated with thickened mucus. Inhaled administration of dornase alfa (Choice D) and other mucolytic agents, such as nebulized hypertonic saline, are also useful in these settings. This patient presenting with a fever and acute respiratory exacerbation in the setting of bronchiectasis would benefit most from antibiotics at this time.

Inhaled administration of antibiotics (Choice C) is studied as a suppressive strategy for stable bronchiectasis, but a patient presenting with signs of systemic infection (eg, fever, tachycardia, leukocytosis) should receive intravenous antibiotics.

Intravenous administration of corticosteroids (Choice F) is commonly employed in treatment of exacerbations of other obstructive airway disorders such as asthma and COPD, but it does not currently have an established benefit in treatment of bronchiectasis.

Educational Objective: Bronchiectasis refers to chronic dilation and distortion of the bronchi and/or bronchioles and can progress to a condition similar to chronic obstructive pulmonary disease with chronic airway inflammation and obstruction to flow. Acute exacerbations are most commonly associated with infection.

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6. A 77-year-old man with hyperlipidemia comes to the physician because of a 3-day history of "turning yellow." During the past 4 weeks, he also has had a 2.3-kg (5-lb) weight loss despite no change in appetite. He says he feels well. He has not had abdominal pain, nausea, vomiting, or changes in bowel movements. His medications are atorvastatin and daily aspirin. He is 180 cm (5 ft 11 in) tall and weighs 79 kg (175 lb); BMI is 24 kg/m^2. His pulse is 80/min and regular, and blood pressure is 130/75 mm Hg. Examination shows jaundice and scleral icterus. There is a palpable, nontender gallbladder; there is no hepatosplenomegaly, and no abdominal masses are noted. Rectal examination shows no masses. Test of the stool for occult blood is negative. Which of the following is the most likely diagnosis?

A) Cholelithiasis
B) Hepatitis A
C) Liver cancer
D) Medication adverse effect
E) Pancreatic cancer

Correct Answer: E.

The patient's presentation with painless jaundice and weight loss is concerning for pancreatic cancer. Cholestatic liver injury, hyperbilirubinemia, jaundice, and scleral icterus result from compression and obstruction of the distal common bile duct as it courses through the pancreatic parenchyma by an enlarging mass. As the disease progresses, patients may experience abdominal pain, weight loss, dark urine, pale stools, and symptoms of malabsorption such as vitamin deficiencies and steatorrhea, as well as complications of metastatic disease. Other causes of extrahepatic biliary obstruction include ascending cholangitis, choledocholithiasis, biliary duct strictures (secondary to inflammation or postoperative), cholangiocarcinoma, primary liver cancer, primary sclerosing cholangitis, primary biliary cholangitis, chronic pancreatitis, and certain infectious organisms (such as liver flukes).

Incorrect Answers: A, B, C, and D.

Cholelithiasis (Choice A) typically presents with biliary colic, which is characterized by intense right upper quadrant abdominal pain associated with nausea, vomiting, and heavy meals that is typically short-lasting. Cholelithiasis may be associated with acute cholecystitis, ascending cholangitis, or acute pancreatitis.

Hepatitis A (Choice B) infection typically presents with acute nausea, vomiting, abdominal pain, icterus, hepatomegaly, and right upper quadrant tenderness. Painless

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D) Medication adverse effect

E) Pancreatic cancer

Correct Answer: E.

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Hepatitis A (Choice B) infection typically presents with acute nausea, vomiting, abdominal pain, icterus, hepatomegaly and right upper quadrant tenderness. Painless jaundice is more suggestive of external compression of the common bile duct, most often caused by adenocarcinoma of the pancreatic head.

Liver cancer (Choice C) can present with obstructive cholestasis depending on the location of the tumor. However, pancreatic cancer has a stronger association with obstructive cholestasis and painless jaundice because of the anatomic course of the common bile duct through the pancreatic parenchyma.

Medication adverse effect (Choice D) can be a cause of intrahepatic cholestasis presenting with painless jaundice. Atorvastatin and aspirin are not commonly associated with drug-induced cholestasis, but a careful medication, supplement, and recreational substance use history should be obtained.

Educational Objective: Pancreatic adenocarcinoma can often present with painless jaundice caused by obstruction of the common bile duct as it passes through the pancreas.

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7. A 17-year-old boy comes to the physician for an examination prior to participation in school sports. He feels well. He has no history of concussions or musculoskeletal injuries. He has never fainted with exercise. He has no history of serious illness and takes no medications. There is no family history of unexplained or cardiac death in adults younger than 50 years. The patient appears well. He is 188 cm (6 ft 2 in) tall and weighs 65 kg (143 lb); BMI is 18 kg/m^2. His arm span is 200 cm (6 ft 6 in). Vital signs are within normal limits. The upper-to-lower body ratio is decreased. Examination shows a long, thin face and large ears. The sclerae are blue, but the retina can be visualized without difficulty. The upper extremities are thin. Examination of the chest shows pectus carinatum. No murmurs are heard on cardiac examination; S_1 and S_2 are normal. Peripheral pulses are normal. Which of the following is the most appropriate next step in evaluation prior to providing clearance for this patient to participate in sports?

A) Cardiac MR angiography
B) Echocardiography
C) Exercise stress test
D) 24-Hour ambulatory ECG monitoring
E) Slit-lamp examination
F) Visual field testing

Correct Answer: B.

This patient's clinical findings of tall stature, long, thin face, blue sclera, pectus carinatum, and long extremities with an increased upper to lower body ratio, are consistent with a diagnosis of Marfan syndrome. Patients with Marfan syndrome may also present with a high, narrow palate, scoliosis, pectus excavatum deformity, and joint hypermobility. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at an increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications and should undergo screening echocardiography prior to participation in sports. According to the 36th Bethesda Conference of the American College of Cardiology, patients with Marfan syndrome may engage in low- and moderate-intensity sports as long as they do not have echocardiographic evidence of aortic root dilatation, moderate-to-severe mitral regurgitation, or a family history of sudden cardiac death. Patients with Marfan syndrome should never participate in contact sports that involve bodily collision because of an increased risk for aortic

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B) Echocardiography
C) Exercise stress test
D) 24-Hour ambulatory ECG monitoring
E) Slit-lamp examination
F) Visual field testing

Correct Answer: B.

This patient's clinical findings of tall stature, long, thin face, blue sclera, pectus carinatum, and long extremities with an increased upper to lower body ratio, are consistent with a diagnosis of Marfan syndrome. Patients with Marfan syndrome may also present with a high, narrow palate, scoliosis, pectus excavatum deformity, and joint hypermobility. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at an increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications and should undergo screening echocardiography prior to participation in sports. According to the 36th Bethesda Conference of the American College of Cardiology, patients with Marfan syndrome may engage in low- and moderate-intensity sports as long as they do not have echocardiographic evidence of aortic root dilatation, moderate-to-severe mitral regurgitation, or a family history of sudden cardiac death. Patients with Marfan syndrome should never participate in contact sports that involve bodily collision because of an increased risk for aortic dissection and rupture.

Incorrect Answers: A, C, D, E, and F.

Cardiac MR angiography (Choice A) and exercise stress testing (Choice C) are useful for the diagnosis of coronary vascular disease but are not necessary for patients with Marfan syndrome.

24-Hour ambulatory ECG monitoring (Choice D) is useful for the diagnosis of an arrhythmia but is not helpful for diagnosis of the most critical cardiovascular complications of Marfan syndrome, including mitral regurgitation and aortic root dilatation.

Slit-lamp examination (Choice E) has an important role in routine monitoring of patients with Marfan syndrome but is not necessary prior to clearance for sports. Impact during contact sports or during trauma increases the risk for lens dislocation caused by zonular fiber laxity. Patients with Marfan syndrome do require annual ophthalmic

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hypermobility. Marfan syndrome is caused by mutations in the FBN1 gene, encoding fibrillin, and is inherited in an autosomal dominant fashion. Fibrillin is an important component of connective tissues throughout the body, including within the major blood vessels and within ocular structures, such as the zonular fibers. Patients with Marfan syndrome are at an increased risk for vascular complications, such as aortic root dilation, aortic aneurysm, and aortic dissection, which may lead to abrupt death at an early age. Patients with Marfan syndrome should undergo annual echocardiography to screen for these complications and should undergo screening echocardiography prior to participation in sports. According to the 36th Bethesda Conference of the American College of Cardiology, patients with Marfan syndrome may engage in low- and moderate-intensity sports as long as they do not have echocardiographic evidence of aortic root dilatation, moderate-to-severe mitral regurgitation, or a family history of sudden cardiac death. Patients with Marfan syndrome should never participate in contact sports that involve bodily collision because of an increased risk for aortic dissection and rupture.

Incorrect Answers: A, C, D, E, and F.

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Slit-lamp examination (Choice E) has an important role in routine monitoring of patients with Marfan syndrome but is not necessary prior to clearance for sports. Impact during contact sports or during trauma increases the risk for lens dislocation caused by zonular fiber laxity. Patients with Marfan syndrome do require annual ophthalmic examinations.

Visual field testing (Choice F) is useful for the diagnosis of glaucoma, which is a common complication of Marfan syndrome. The presence of glaucoma is not a direct contraindication to participation in sports.

Educational Objective: Patients with Marfan syndrome are at an increased risk for vascular and ophthalmic complications and should undergo annual echocardiography and ophthalmic examination. Patients with Marfan syndrome may engage in low- and moderate-intensity sports as long as they do not have echocardiographic evidence of aortic root dilatation, moderate-to-severe mitral regurgitation, or a family history of sudden cardiac death. Patients should never participate in contact sports that involve bodily collision.

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8. A previously healthy 1-year-old boy is brought to the emergency department by his mother because of a 3-day history of fever, fussiness, and poor feeding. He was born at 38 weeks' gestation and delivered by a midwife at home. His mother received no prenatal care. Immunizations are up-to-date. On arrival, the patient is irritable but consolable and does not appear toxic. His temperature is 40°C (104°F), pulse is 140/min, and respirations are 40/min. Capillary refill time is 2 seconds. The anterior fontanel is open, soft, and flat. The mucous membranes are moist. Examination shows no other abnormalities. Urinalysis shows:

pH	6.0
Specific gravity	1.005
Blood	1+
Protein	1+
RBC	10/hpf
WBC	>100/hpf
Nitrites	negative
Leukocyte esterase	positive

Results of a complete blood count, serum studies, and blood and urine cultures are pending. Which of the following is the most appropriate next step in diagnosis?

A) CT scan of the abdomen
B) Dimercaptosuccinic acid renal scan
C) Intravenous pyelography
D) Renal ultrasonography
E) X-ray of the abdomen

Correct Answer: D.

Risk factors for urinary tract infections in males include an age less than 1 year and congenital urinary tract abnormalities. Congenital urinary tract abnormalities include but are not limited to unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Regardless of the cause of malformation, ureteral obstruction and vesicoureteral reflux are common complications

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Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

CT scan of the abdomen (Choice A) can evaluate for hydroureteronephrosis but exposes infants to unnecessary radiation when ultrasonography is the first-line diagnostic modality for evaluating for the presence of congenital hydroureteronephrosis.

Dimercaptosuccinic acid renal scan (Choice B) is a radionuclide scan that is able to assess for renal morphologic abnormalities such as renal scarring, renal agenesis, ectopic kidneys, and renal masses. Renal ultrasonography remains the first-line diagnostic test for urinary tract abnormalities.

Intravenous pyelography (Choice C) involves the intravenous injection of radio-opaque contrast to visualize the renal collecting system, ureters, and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures. It exposes infants to radiation and renal ultrasonography is a first-line test that does not require radiation.

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Correct Answer: D.

Risk factors for urinary tract infections in males include an age less than 1 year and congenital urinary tract abnormalities. Congenital urinary tract abnormalities include but are not limited to unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Regardless of the cause of malformation, ureteral obstruction and vesicoureteral reflux are common complications. Chronic reflux can lead to hydroureter and hydronephrosis, characterized by dilation of the renal pelvis and calyces resulting in compression atrophy of the renal parenchyma and eventual renal insufficiency and failure. Hydronephrosis can be graded in severity, in which the most severe cases compress the parenchyma resulting in gross distortion of renal architecture. The diagnosis of vesicoureteral reflux, hydroureteronephrosis, and congenital urinary tract abnormalities is often completed with renal ultrasonography followed by fluoroscopic voiding cystourethrography, if necessary.

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Intravenous pyelography (Choice C) involves the intravenous injection of radio-opaque contrast to visualize the renal collecting system, ureters, and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures. It exposes infants to radiation and renal ultrasonography is a first-line test that does not require radiation.

X-ray of the abdomen (Choice E) is not a sensitive or specific test for urinary tract abnormalities but is often utilized for the evaluation of acute abdominal pathology (eg, small bowel obstruction), and would serve no purpose in the work-up for congenital hydroureteronephrosis.

Educational Objective: Risk factors for urinary tract infections in males include an age less than 1 year and congenital urinary tract abnormalities. The diagnosis of vesicoureteral reflux, hydroureteronephrosis, and congenital urinary tract abnormalities is often completed with renal ultrasonography followed by fluoroscopic voiding cystourethrography, if necessary.

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9. A 56-year-old man comes to the physician with his wife because of a 2-year history of increasing restlessness while he is asleep. His wife reports that he kicks his legs and swings his arms several times during the night. He appears to be asleep during these episodes, and he typically says that he was dreaming if awakened during an episode. His wife now sleeps in a separate bed after he hit her during one of the episodes 1 year ago. He has a 3-year history of mild depression treated with weekly psychotherapy. He takes no medications. He does not smoke cigarettes, drink alcohol, or use illicit drugs. Examination shows an occasional mild, rhythmic, involuntary shaking of the right hand that is most noticeable when the hand is in his lap. This patient is at greatest risk for developing which of the following conditions?

A) Alzheimer disease
B) Amyotrophic lateral sclerosis
C) Corticobasal degeneration
D) Creutzfeldt-Jakob disease
E) Parkinson disease

Correct Answer: E.

In typical rapid-eye movement (REM) sleep, several neural circuits terminate on spinal cord motoneurons to cause sleep atonia. In REM sleep behavior disorder (RBD), this muscle atonia is lost, and patients can violently act out their dreams. They typically remember these dreams. RBD most commonly occurs in older males and can be idiopathic or related to conditions of α-synuclein deposition such as Parkinson disease, multiple system atrophy, and Lewy body dementia. Polysomnography showing a lack of atonia during REM sleep confirms the diagnosis. Treatment includes creating a safe sleep environment and, if the behavior is severe, initiating melatonin or clonazepam. Patients with idiopathic RBD should be closely monitored because of the high conversion rate to neurodegenerative disease. This patient with a resting tremor may be beginning to develop Parkinson disease, which typically presents with bradykinesia, muscle rigidity, resting tremor, and postural instability.

Incorrect Answers: A, B, C, and D.

Alzheimer disease (Choice A) results from amyloid and tau protein pathology and presents with progressive cognitive decline that culminates in the inability to perform basic activities of daily living. Amyotrophic lateral sclerosis (Choice B) is a progressive neurodegenerative disorder featuring a combination of upper and lower motoneuron

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A) Alzheimer disease
B) Amyotrophic lateral sclerosis
C) Corticobasal degeneration
D) Creutzfeldt-Jakob disease
E) Parkinson disease

Correct Answer: E.

In typical rapid-eye movement (REM) sleep, several neural circuits terminate on spinal cord motoneurons to cause sleep atonia. In REM sleep behavior disorder (RBD), this muscle atonia is lost, and patients can violently act out their dreams. They typically remember these dreams. RBD most commonly occurs in older males and can be idiopathic or related to conditions of α-synuclein deposition such as Parkinson disease, multiple system atrophy, and Lewy body dementia. Polysomnography showing a lack of atonia during REM sleep confirms the diagnosis. Treatment includes creating a safe sleep environment and, if the behavior is severe, initiating melatonin or clonazepam. Patients with idiopathic RBD should be closely monitored because of the high conversion rate to neurodegenerative disease. This patient with a resting tremor may be beginning to develop Parkinson disease, which typically presents with bradykinesia, muscle rigidity, resting tremor, and postural instability.

Incorrect Answers: A, B, C, and D.

Alzheimer disease (Choice A) results from amyloid and tau protein pathology and presents with progressive cognitive decline that culminates in the inability to perform basic activities of daily living. Amyotrophic lateral sclerosis (Choice B) is a progressive neurodegenerative disorder featuring a combination of upper and lower motoneuron weakness patterns that may result from RNA processing and/or excitotoxicity. Corticobasal degeneration (Choice C) is a rare progressive neurodegenerative disease involving tau protein pathology that leads to basal ganglia and cerebral cortex atrophy. Patients typically present with parkinsonism, executive dysfunction, and behavioral changes. Creutzfeldt-Jakob disease (Choice D) is a neurodegenerative prion disease characterized by the accumulation of misfolded proteins and manifests with rapidly progressive dementia, myoclonus, and ataxia. None of these conditions involve α-synuclein deposition or an association with RBD.

Educational Objective: REM sleep behavior disorder (RBD) features a lack of normal muscle atonia during REM sleep, most commonly occurring in older male patients. RBD can be idiopathic or associated with conditions of α-synuclein deposition such as Parkinson disease.

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10. A 16-year-old boy is brought to the emergency department 15 minutes after involvement in a motor vehicle collision. He was the restrained driver. His car crashed into the car in front of him, then was hit from behind by a pickup truck. The patient's car was destroyed, but he was able to walk away from the scene of the collision. On arrival, he is upset and reports moderate chest pain. His pulse is 100/min, respirations are 20/min, and blood pressure is 130/80 mm Hg. Examination shows erythema over the chest in the area where his seat belt had been fastened. No other abnormalities are noted. Serum studies show:

Creatine kinase, total	221 U/L
MB fraction	20% (N<5% total CK)
Troponin I	1 ng/mL (N<0.1)
Troponin T	0.3 ng/mL (N<0.1)

Chest x-rays show no abnormalities. An ECG shows a normal sinus rhythm and nonspecific T-wave inversion in leads V_3 through V_6. Which of the following is the most appropriate next step in management?

A) Hyperoxygenation
B) Intravenous administration of a β-adrenergic blocking agent
C) Intravenous administration of 0.45% saline
D) Serial ECG monitoring
E) Thrombolysis

Correct Answer: D.

Serial ECG monitoring after admission to the hospital is the most appropriate next step in management. This patient, who suffered blunt trauma to the chest and now has chest pain, mildly increased troponin concentration, and ECG showing T-wave inversions most likely has a myocardial contusion. Myocardial contusion may occur as the result of any blunt trauma to the chest but is more common after deceleration injuries. Because of the location of the right atrium and ventricle closer to the surface of the chest, the right side of the heart is more frequently injured than the left. While catastrophic injury to the valves, the interventricular septum, or the ventricular free wall can result in rapid decompensation and death, mild myocardial contusion may present with more subtle findings, including new ECG changes. ECG changes are highly diverse, and patients may develop anything from new bundle branch blocks to cardiac conduction delays, supraventricular tachycardia, or nonspecific ST segment

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Incorrect Answers: A, B, C, and E.

Hyperoxygenation (Choice A) is employed to treat pneumothorax as it is believed to help resolve the pneumothorax more expediently. This patient does not have evidence of a pneumothorax.

Intravenous administration of a β-adrenergic blocking agent (Choice B) would be appropriate if this patient was found to have evidence of an aortic dissection or within the first 24 hours of a hemodynamically stable acute coronary syndrome. His presentation is more consistent with myocardial contusion.

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E) Thrombolysis

Correct Answer: D.

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Intravenous administration of 0.45% saline (Choice C) is incorrect. This patient has no indication for intravenous fluids because his blood pressure is normal and there is no evidence of hypovolemia. His borderline tachycardia is more likely secondary to cardiac injury.

Thrombolysis (Choice E) is indicated for patients with massive pulmonary embolism who exhibit signs of shock, which this patient lacks.

Educational Objective: Myocardial contusion describes injury to the myocardium that may occur after blunt trauma to the chest. Patients may present with chest pain, increased concentrations of troponins, and a wide array of potential ECG changes. Patients with ECG changes should be admitted for observation and serial ECG monitoring.

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11. A state health department is alerted to a potential outbreak of hepatitis A during the past 2 weeks involving a restaurant in a city with a population of 350,000. After a preliminary descriptive analysis, including case identification, the health department matches cases with control subjects and examines foods that are potential sources of infection. Which of the following is the most appropriate statistical analysis for the investigators to determine the source of this outbreak?

A) Absolute risk
B) Attributable risk
C) Odds ratio
D) Relative risk
E) Risk reduction

Correct Answer: C.

This study compares one group of patients with an outcome under study (hepatitis A) (cases) against a second matched group without that outcome (controls) and identifies the associated exposure within each group. This study design is known as a case-control study. Case-control studies can be conducted in a prospective or retrospective manner but are always observational studies. By grouping patients by outcome and comparing differences in the odds of exposure, case-control studies can detect associations between exposure and outcome, such as exposure to particular foods and outcome of developing hepatitis A in this study. This is described statistically as an odds ratio (OR). Two unrelated variables will have an OR of 1.0, whereas positive association between an exposure and an outcome will have an OR greater than 1.0 and negatively-associated variables will have an OR less than 1.0. Case-control studies are therefore capable of establishing association between the exposure and outcome, but do not establish causality.

Incorrect Answers: A, B, D, and E.

Absolute risk (Choice A) calculates the risk for an event within a particular group and is calculated by dividing the number of events of interest by the number of individuals within the group. It is not a statistic employed in case-control studies.

Attributable risk (AR) (Choice B) describes the risk for developing the disease or outcome that can be attributed to the exposure as compared to the risk that exists without

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D) Relative risk

E) Risk reduction

Correct Answer: C.

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Absolute risk (Choice A) calculates the risk for an event within a particular group and is calculated by dividing the number of events of interest by the number of individuals within the group. It is not a statistic employed in case-control studies.

Attributable risk (AR) (Choice B) describes the risk for developing the disease or outcome that can be attributed to the exposure as compared to the risk that exists without the exposure. AR is calculated as the difference between disease or outcome incidence among those with the exposure and those without the exposure. AR is therefore more commonly employed in cohort studies or randomized controlled trials.

Relative risk (RR) (Choice D) assesses the difference in risk for developing an outcome between an exposed group and a non-exposed group by comparing the incidence rate of the event in each group. Similar to AR, RR is more commonly employed in cohort studies.

Risk reduction (Choice E) is the difference in outcome between a group receiving an intervention and a placebo group. It is not typically employed in case-control studies.

Educational Objective: Case-control studies group patients according to disease outcome status and analyze the odds of exposure to a particular hazard. The appropriate statistical measure of case-control studies is the odds ratio.

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12. A 52-year-old man is brought to the emergency department because of a 6-hour history of thirst and fatigue and a 2-hour history of light-headedness. He has been working outside during the past 2 days in temperatures reaching 90.0°F. He has no history of serious illness and takes no medications. On arrival, he is lethargic. He is oriented to person but not to place or time. His temperature is 37.2°C (99.0°F), pulse is 74/min and irregular, respirations are 16/min, and blood pressure is 95/64 mm Hg. The lungs are clear to auscultation. No bruits are heard. No murmurs are heard on cardiac examination. The abdomen is nontender. ECG is shown. In addition to intravenous administration of fluids, which of the following is the most appropriate next step in management?

A) Adenosine therapy
B) Atropine therapy
C) Lidocaine therapy
D) Placement of a pacemaker
E) Observation only

Correct Answer: E.

This patient is likely suffering from dehydration characterized by thirst, fatigue, and lightheadedness after working in a hot environment. ECG discloses an irregular, narrow-complex arrhythmia lacking P-waves, consistent with atrial fibrillation. Atrial fibrillation typically presents with palpitations, fatigue, lightheadedness, and dyspnea if

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Correct Answer: E.

This patient is likely suffering from dehydration characterized by thirst, fatigue, and lightheadedness after working in a hot environment. ECG discloses an irregular, narrow-complex arrhythmia lacking P-waves, consistent with atrial fibrillation. Atrial fibrillation typically presents with palpitations, fatigue, lightheadedness, and dyspnea if symptomatic. Atrial fibrillation can result from a variety of factors, including dehydration, electrolyte abnormalities, alcohol or illicit drug use, and structural heart disease. For example, mitral stenosis, if severe enough, can result in left atrial enlargement, cardiogenic pulmonary edema, and arrhythmias such as atrial fibrillation and flutter. Hyperthyroidism and thyrotoxicosis are also associated with the development of atrial fibrillation. Atrial fibrillation can be complicated by a rapid ventricular response (pulse >100/min), which can result in reduced stroke volume and decreased cardiac output leading to symptomatic heart failure, and potentially hypotension and hemodynamic instability in severe cases. In these cases, rate- or rhythm-controlling agents and/or synchronized cardioversion may be necessary. However, in this patient who is hemodynamically stable with a normal ventricular rate, no further interventions are necessary other than intravenous fluid resuscitation for the patient's dehydration, which will likely improve his symptoms. He will eventually require evaluation to determine if anticoagulant therapy or rate control will be needed.

Incorrect Answers: A, B, C, and D.

Adenosine (Choice A) is a purine analogue with atrioventricular nodal blockade effects that is useful for the treatment of supraventricular tachycardia. It plays little to no role in the management of atrial fibrillation

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Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Adenosine (Choice A) is a purine analogue with atrioventricular nodal blockade effects that is useful for the treatment of supraventricular tachycardia. It plays little to no role in the management of atrial fibrillation.

Atropine (Choice B) is a cholinergic inhibitor that is used in the management of symptomatic bradycardia. This patient's pulse is 74/min, which is normal, and atropine would be unnecessary.

Lidocaine (Choice C) is a class I antiarrhythmic that inhibits sodium channels. It can be used intravenously to treat ventricular tachyarrhythmias. This patient is not tachycardic and has a narrow QRS complex, making ventricular tachyarrhythmia unlikely.

Placement of a pacemaker (Choice D) would be indicated in patients with sick sinus syndrome, symptomatic bradycardia, ventricular tachyarrhythmias, or high-grade AV nodal block.

Educational Objective: Atrial fibrillation is characterized by an irregular, narrow-complex arrhythmia lacking P-waves on ECG. If the patient is hemodynamically stable with a normal ventricular rate, treatment is focused on correcting underlying conditions that may cause atrial fibrillation.

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13. A previously healthy 19-year-old man comes to the physician because of a 3-day history of an increasingly severe bilateral headache and a 1-day history of fever and diarrhea. He says he feels sore all over. Use of acetaminophen has not relieved his headache. He is a college student and lives in a dormitory. He is in moderate distress and closes his eyes when lights are turned on. His temperature is 38°C (100.4°F), pulse is 100/min, respirations are 22/min, and blood pressure is 120/70 mm Hg. Examination shows dry mucous membranes and nuchal rigidity. Funduscopic examination shows no abnormalities. Neurologic examination, including mental status examination, shows no abnormalities. His serum glucose concentration is 90 mg/dL. A CT scan of the head without contrast shows no abnormalities. A lumbar puncture is performed. Cerebrospinal fluid analysis shows a glucose concentration of 70 mg/dL, a protein concentration of 35 mg/dL, and a leukocyte count of 50/mm^3 (100% monocytes). Which of the following is the most likely diagnosis?

A) Aseptic meningitis
B) Bacterial meningitis
C) Fungal meningitis
D) Parasitic meningoencephalitis
E) Viral encephalitis

Correct Answer: A.

Meningitis classically presents with acute headache, fever, photophobia, and neck stiffness, with variable causes from bacterial, viral, or fungal sources. Cerebrospinal fluid with 50/mm^3 leukocytes (100% monocytes), normal or increased protein, and normal glucose is consistent with viral meningitis (also called 'aseptic' meningitis). In viral meningitis, leukocyte count is typically less than 100/mm^3 with a predominance of lymphocytes. In contrast, bacterial meningitis will have a leukocyte count often >1000/mm^3 with a predominance of neutrophils, increased protein, and decreased glucose. In addition, this patient presents with other viral illness signs and symptoms, including diarrhea and myalgias. Treatment of aseptic meningitis is generally supportive, and while complications occur, the prognosis is generally good.

Incorrect Answers: B, C, D, and E.

Patients with bacterial meningitis (Choice B) usually present with nuchal rigidity, high fever, a petechial rash, and altered mentation. Meningococcal meningitis is caused by infection with *Neisseria meningitidis*, the most common cause of bacterial meningitis in teenagers and young adults. The cerebrospinal fluid analysis of bacterial meningitis

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B) Parasitic meningoencephalitis

E) Viral encephalitis

Correct Answer: A.

Meningitis classically presents with acute headache, fever, photophobia, and neck stiffness, with variable causes from bacterial, viral, or fungal sources. Cerebrospinal fluid with 50/mm^3 leukocytes (100% monocytes), normal or increased protein, and normal glucose is consistent with viral meningitis (also called 'aseptic' meningitis). In viral meningitis, leukocyte count is typically less than 100/mm^3 with a predominance of lymphocytes. In contrast, bacterial meningitis will have a leukocyte count often >1000/mm^3 with a predominance of neutrophils, increased protein, and decreased glucose. In addition, this patient presents with other viral illness signs and symptoms, including diarrhea and myalgias. Treatment of aseptic meningitis is generally supportive, and while complications occur, the prognosis is generally good.

Incorrect Answers: B, C, D, and E.

Patients with bacterial meningitis (Choice B) usually present with nuchal rigidity, high fever, a petechial rash, and altered mentation. Meningococcal meningitis is caused by infection with *Neisseria meningitidis*, the most common cause of bacterial meningitis in teenagers and young adults. The cerebrospinal fluid analysis of bacterial meningitis shows increased leukocytes with a neutrophil predominance, increased protein, and decreased glucose.

Fungal meningitis (Choice C), such as with *Cryptococcus neoformans*, is a potential cause of meningitis in immunocompromised patients. Staining with India ink preparation or mucicarmine showsan encapsulated yeast with narrow-based budding. Similar to viral meningitis, fungal meningitis discloses a predominance of lymphocytes, but glucose is typically low.

Parasitic meningoencephalitis (Choice D) is rare, sometimes caused by *Naegleria fowleri* after exposure to contaminated fresh water. It is a rapidly progressive disease that has a high mortality rate and would be unlikely in this patient.

Herpes simplex virus may cause viral encephalitis (Choice E) in patients of all ages and may present with fever, headache, seizures, focal neurologic signs, and confusion. Imaging may show inflammation in the temporal lobe. Nuchal rigidity is more suggestive of meningitis.

Educational Objective: In viral (aseptic) meningitis, cerebrospinal fluid analysis shows a leukocyte count typically less than 100/mm^3 with a predominance of lymphocytes, normal or increased protein, and normal glucose.

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14. An 82-year-old man is brought to the emergency department because of a 2-hour history of progressive shortness of breath. He has not had chest pain, fever, chills, or cough. He has coronary artery disease, essential hypertension, and hypercholesterolemia. Three years ago, he underwent uncomplicated coronary artery bypass grafting. His medications are clopidogrel, enalapril, rosuvastatin, and daily aspirin. He smoked one and one-half packs of cigarettes daily for 59 years but quit 3 years ago. He drinks two glasses of wine daily. His temperature is 37°C (98.6°F), pulse is 90/min and regular, respirations are 26/min, and blood pressure is 118/78 mm Hg. Examination shows jugular venous distention. Crackles are heard in the lung bases; scattered expiratory wheezes are heard in all lung fields. On cardiac examination, an S_3 gallop is heard. There is 2+ pretibial and 3+ pedal edema bilaterally. A chest x-ray shows bilateral pulmonary infiltrates, prominent hilar vascularity, and cardiomegaly. Which of the following is most likely to be decreased in this patient?

A) Central venous pressure
B) Pulmonary capillary wedge pressure
C) Shunt fraction (Qs/Qt)
D) Stroke volume index
E) Systemic vascular resistance

Correct Answer: D.

The patient is presenting with acute decompensated congestive heart failure, supported by the presence of progressive shortness of breath, tachypnea, jugular venous distention, pulmonary crackles and wheezes, an S_3 gallop, and peripheral edema. Chest x-ray supports this diagnosis with evidence of pulmonary congestion and an enlarged cardiac silhouette. Heart failure is a common complication of ischemic heart disease. The hemodynamic profile of acute decompensated heart failure is characterized by a decreased stroke volume index caused by severe dysfunction of cardiomyocytes resulting in markedly decreased contractility. Pulmonary artery catheterization typically discloses increased central venous pressure and increased pulmonary capillary wedge pressure secondary to systolic dysfunction and impaired forward flow of blood. Systemic vascular resistance is increased as a physiologic attempt to maintain mean arterial pressure for peripheral perfusion as the cardiac output falls. The patient may progress to a state of cardiogenic shock if therapeutic measures are not initiated. Treatment generally consists of supplemental oxygen, diuresis, inotropic support if needed, and management of the underlying cause of the acute decompensation.

Incorrect Answers: A, B, C, and E.

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C) Shunt fraction (Qs/Qt)

D) Stroke volume index

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Incorrect Answers: A, B, C, and E.

Central venous pressure (Choice A) and pulmonary capillary wedge pressure (Choice B) are often increased in the setting of decompensated heart failure because of impaired forward flow of blood and pooling in the central venous system and pulmonary vasculature.

Shunt fraction (Qs/Qt) (Choice C) describes the fraction of blood flow that does not participate in gas exchange during a circulatory cycle. The presence of pulmonary edema decreases the effective alveolar surface area that can participate in gas exchange, and the shunt fraction would be expected to increase.

Systemic vascular resistance (Choice E) is typically increased in the setting of acute decompensated heart failure as a physiologic attempt to maintain mean arterial pressure.

Educational Objective: The hemodynamic profile of acute decompensated heart failure and cardiogenic shock is characterized by decreased stroke volume, decreased cardiac index, increased central venous pressure, increased pulmonary capillary wedge pressure, and increased systemic vascular resistance.

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15. A 67-year-old woman comes to the office for evaluation 2 weeks before a scheduled right total hip replacement under general anesthesia. She has a 20-year history of rheumatoid arthritis. Current medications are methotrexate, prednisone, and leflunomide. On examination, any movement of the right hip causes pain. Results of laboratory studies are within the reference ranges. In addition to a chest x-ray and posteroanterior and lateral x-rays of the right hip, which of the following is the most appropriate imaging study before the operation?

A) Chest x-rays on inspiration and expiration
B) CT scan of the abdomen
C) Lateral x-ray of the cervical spine on flexion and extension
D) MRI of the right hip
E) Odontoid x-ray of the open mouth

Correct Answer: C.

Rheumatoid arthritis is an autoimmune inflammatory arthritis that can also lead to systemic manifestations, such as fevers, weight loss, osteopenia, myopathy, rheumatoid nodules, vasculitis, and pulmonary or cardiac disease (eg, pleurisy, pericarditis). It classically presents with gradual onset of pain and stiffness in multiple joints, specifically the metacarpophalangeal and proximal interphalangeal joints. The stiffness is often worse in the morning and improves later in the day. Physical examination will show symmetric joint swelling, and long-standing disease can cause progressive joint damage and subsequent deformity. While the peripheral joints are more commonly affected, the axial skeleton can also be involved, particularly the joints of the cervical spine. This can lead to instability and subluxation of the atlantoaxial joint, with resulting spinal cord compression. Lateral x-ray of the cervical spine on flexion and extension should be obtained in this patient to investigate possible cervical spine translational instability prior to undergoing a general anesthetic. This is pertinent as the positioning required for intubation may lead to permanent paralysis or death in the setting of cervical spine instability. If evidence of cervical spine instability is present, this should be addressed prior to her elective hip arthroplasty.

Incorrect Answers: A, B, D, and E.

Chest x-rays on inspiration and expiration (Choice A) are not necessary. While rheumatoid arthritis can cause pulmonary manifestations such as pleurisy, interstitial lung disease, and pulmonary nodules, chest x-rays on inspiration and expiration would offer no additional information to that which will be gained from the regular chest x-ray

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Correct Answer: C.

Rheumatoid arthritis is an autoimmune inflammatory arthritis that can also lead to systemic manifestations, such as fevers, weight loss, osteopenia, myopathy, rheumatoid nodules, vasculitis, and pulmonary or cardiac disease (eg, pleurisy, pericarditis). It classically presents with gradual onset of pain and stiffness in multiple joints, specifically the metacarpophalangeal and proximal interphalangeal joints. The stiffness is often worse in the morning and improves later in the day. Physical examination will show symmetric joint swelling, and long-standing disease can cause progressive joint damage and subsequent deformity. While the peripheral joints are more commonly affected, the axial skeleton can also be involved, particularly the joints of the cervical spine. This can lead to instability and subluxation of the atlantoaxial joint, with resulting spinal cord compression. Lateral x-ray of the cervical spine on flexion and extension should be obtained in this patient to investigate possible cervical spine translational instability prior to undergoing a general anesthetic. This is pertinent as the positioning required for intubation may lead to permanent paralysis or death in the setting of cervical spine instability. If evidence of cervical spine instability is present, this should be addressed prior to her elective hip arthroplasty.

Incorrect Answers: A, B, D, and E.

Chest x-rays on inspiration and expiration (Choice A) are not necessary. While rheumatoid arthritis can cause pulmonary manifestations such as pleurisy, interstitial lung disease, and pulmonary nodules, chest x-rays on inspiration and expiration would offer no additional information to that which will be gained from the regular chest x-ray she will receive.

CT scan of the abdomen (Choice B) is not necessary. Rheumatoid arthritis is rarely associated with focal glomerulonephritis, and kidney dysfunction can develop because of the disease itself or because of the use of medications to treat the disease. However, a CT scan of the abdomen is unlikely to change anesthetic management.

MRI of the right hip (Choice D) is not required. X-ray is typically sufficient to evaluate the degree of osteoarthritis and for surgical planning.

Odontoid x-ray of the open mouth (Choice E) can be used to evaluate the upper cervical spine, particularly the atlas (C1) and axis (C2). While this may be valuable in the evaluation of cervical spine instability in acute trauma, it does not allow for the evaluation of anterior-posterior translational instability in rheumatoid arthritis.

Educational Objective: Rheumatoid arthritis is an autoimmune erosive arthritis that also presents with systemic symptoms. The cervical spine is often affected, particularly in long-standing disease, which can cause cervical spine instability. This should be evaluated with lateral x-ray of the cervical spine in flexion and extension prior to undergoing general anesthesia because the positioning required for intubation may lead to paralysis or death if translational instability is present and unrecognized.

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16. A 30-year-old man is brought to the emergency department 30 minutes after a 20-second generalized tonic-clonic seizure. He has a 3-week history of early morning projectile vomiting, headache, and blurred vision. On arrival, he is mildly lethargic. He has no history of serious illness and takes no medications. His father died of brain cancer at the age of 45 years. The patient has no known sick contacts. He does not smoke cigarettes or drink alcohol. His temperature is 37°C (98.6°F), pulse is 92/min, respirations are 18/min, and blood pressure is 138/98 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Finger-nose testing shows dysmetria. There is decreased rapid alternating movement of the hands. His gait is unsteady. An MRI of the brain shows a vascular tumor in the posterior fossa and ventriculomegaly of the third and lateral ventricles. Which of the following tests is most likely to reveal a second tumor with the same genetic abnormality?

A) Bone marrow biopsy
B) Colonoscopy
C) CT scan of abdomen
D) Mammography
E) Serum carcinoembryonic antigen (CEA) assay

Correct Answer: C.

CT scan of the abdomen will most likely show vascular tumors of either the pancreas or the kidney, which would be most consistent with a diagnosis of von Hippel-Lindau disease. The presence of multiple vascular tumors would be highly suggestive of this disease. Von Hippel-Lindau disease is a heritable neurocutaneous disorder that presents with multiple benign and malignant tumors. Many tumors originate from the vasculature, including hemangioblastomas of the retina and cerebellum and angiomatosis of the skin and mucosa. Additional tumors include renal clear cell carcinomas, pancreatic masses, and pheochromocytomas. Diagnosis occurs by genetic testing that discloses the pathogenic variant of the VHL gene, which is typically inherited in an autosomal dominant fashion. Management involves surgical excision of the tumors. This patient has evidence of obstructive hydrocephalus leading to increased intracranial pressure secondary to a posterior fossa tumor and should be evaluated urgently by a neurosurgeon.

Incorrect Answers: A, B, D, and E.

Bone marrow biopsy (Choice A) is indicated for patients who are thought to have certain hematologic malignancies such as leukemia or lymphoma. It is not necessary in

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Correct Answer: C.

CT scan of the abdomen will most likely show vascular tumors of either the pancreas or the kidney, which would be most consistent with a diagnosis of von Hippel-Lindau disease. The presence of multiple vascular tumors would be highly suggestive of this disease. Von Hippel-Lindau disease is a heritable neurocutaneous disorder that presents with multiple benign and malignant tumors. Many tumors originate from the vasculature, including hemangioblastomas of the retina and cerebellum and angiomatosis of the skin and mucosa. Additional tumors include renal clear cell carcinomas, pancreatic masses, and pheochromocytomas. Diagnosis occurs by genetic testing that discloses the pathogenic variant of the VHL gene, which is typically inherited in an autosomal dominant fashion. Management involves surgical excision of the tumors. This patient has evidence of obstructive hydrocephalus leading to increased intracranial pressure secondary to a posterior fossa tumor and should be evaluated urgently by a neurosurgeon.

Incorrect Answers: A, B, D, and E.

Bone marrow biopsy (Choice A) is indicated for patients who are thought to have certain hematologic malignancies such as leukemia or lymphoma. It is not necessary in this patient.

Colonoscopy (Choice B) is indicated for patients with central nervous system lesions that are thought to represent metastatic disease from a primary colon cancer or for malignancy syndromes that may involve the central nervous system and gastrointestinal tract. Metastatic lesions are frequently multiple and exist at the grey-white matter junction and are uncommonly in the posterior fossa.

Mammography (Choice D) is indicated as a screening procedure for women over the age of 40 to 45 years to evaluate for the presence of breast cancer. Breast cancer is an unlikely diagnosis in a 30-year-old man with a posterior fossa tumor.

Serum carcinoembryonic antigen (CEA) assay (Choice E) is a tumor marker that is sometimes detected in patients with colon or ovarian cancer. While it can be helpful, it is ultimately non-specific and is unlikely to be increased in this patient.

Educational Objective: Von Hippel-Lindau disease is an autosomal dominant neurocutaneous disorder that presents with multiple benign and malignant tumors. Many tumors originate from the vasculature, including hemangioblastomas of the retina and central nervous system, and angiomatosis of the skin and mucosa. Tumors of the kidney and pancreas also occur.

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17. A 19-year-old woman is admitted to the hospital because of a 6-day history of severe abdominal pain and bloody diarrhea. She has no history of serious illness. Her temperature is 37.8°C (100°F), pulse is 75/min, respirations are 26/min, and blood pressure is 120/70 mm Hg. Abdominal examination shows no distention; there is mild tenderness to palpation. Laboratory studies show:

Hemoglobin	9.2 g/dL
Reticulocyte count	5.4%
Platelet count	17,000/mm^3
Serum	
Total bilirubin	2.5 mg/dL
Haptoglobin	8.2 mg/dL (N=40–265)
Lactate dehydrogenase	4285 U/L

Which of the following is the most likely infectious agent?

A) *Escherichia coli*
B) *Giardia lamblia*
C) *Salmonella typhi*
D) *Shigella sonnei*
E) *Staphylococcus aureus*

Correct Answer: A.

Escherichia coli, specifically shiga-toxin producing *E. coli* (STEC) infection, is the most likely cause of this patient's bloody diarrhea, thrombocytopenia, and hemolytic anemia. Frequently, this type of infection also causes acute renal failure. Shiga-toxin causes diffuse endothelial dysfunction with a tendency toward microvascular thrombosis. Widespread microvascular thrombosis consumes platelets and predisposes circulating erythrocytes to shearing forces as a result of a structurally obstructed vascular lumen. When erythrocytes come into contact with microvascular clots, they are damaged, forming schistocytes, which are apparent on the peripheral blood smear as fragmented cells. They also release lactate dehydrogenase (LDH) leading to an increased concentration of serum LDH, while haptoglobin is depleted by binding to free

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Lactate dehydrogenase	4285 U/L

Which of the following is the most likely infectious agent?

A) *Escherichia coli*
B) *Giardia lamblia*
C) *Salmonella typhi*
D) *Shigella sonnei*
E) *Staphylococcus aureus*

Correct Answer: A.

Escherichia coli, specifically shiga-toxin producing *E. coli* (STEC) infection, is the most likely cause of this patient's bloody diarrhea, thrombocytopenia, and hemolytic anemia. Frequently, this type of infection also causes acute renal failure. Shiga-toxin causes diffuse endothelial dysfunction with a tendency toward microvascular thrombosis. Widespread microvascular thrombosis consumes platelets and predisposes circulating erythrocytes to shearing forces as a result of a structurally obstructed vascular lumen. When erythrocytes come into contact with microvascular clots, they are damaged, forming schistocytes, which are apparent on the peripheral blood smear as fragmented cells. They also release lactate dehydrogenase (LDH) leading to an increased concentration of serum LDH, while haptoglobin is depleted by binding to free hemoglobin. Thrombosis also occurs in the renal vasculature because of underlying endothelial damage, resulting in renal injury. Treatment of STEC is supportive. Antibiotics are typically avoided as they can result in increased release of shiga-toxin and clinical deterioration, although in some instances the use of macrolide antibiotics has been shown to be beneficial. This collection of clinical manifestations, including renal failure, thrombocytopenia, and microangiopathic hemolytic anemia (MAHA) is called hemolytic uremic syndrome (HUS).

Incorrect Answers: B, C, D, and E.

Giardia lamblia (Choice B) infection causes chronic, foul-smelling explosive diarrhea but does not result in bloody diarrhea, MAHA, or thrombocytopenia.

Salmonella typhi (Choice C) infection causes enteric fever, which presents with fever, bacteremia, and rose-colored spots on the chest and abdomen. Pulse-temperature dissociation in which patients with fever present with bradycardia is frequently seen.

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B) *Shigella sonnei*

E) *Staphylococcus aureus*

Correct Answer: A.

Escherichia coli, specifically shiga-toxin producing *E. coli* (STEC) infection, is the most likely cause of this patient's bloody diarrhea, thrombocytopenia, and hemolytic anemia. Frequently, this type of infection also causes acute renal failure. Shiga-toxin causes diffuse endothelial dysfunction with a tendency toward microvascular thrombosis. Widespread microvascular thrombosis consumes platelets and predisposes circulating erythrocytes to shearing forces as a result of a structurally obstructed vascular lumen. When erythrocytes come into contact with microvascular clots, they are damaged, forming schistocytes, which are apparent on the peripheral blood smear as fragmented cells. They also release lactate dehydrogenase (LDH) leading to an increased concentration of serum LDH, while haptoglobin is depleted by binding to free hemoglobin. Thrombosis also occurs in the renal vasculature because of underlying endothelial damage, resulting in renal injury. Treatment of STEC is supportive. Antibiotics are typically avoided as they can result in increased release of shiga-toxin and clinical deterioration, although in some instances the use of macrolide antibiotics has been shown to be beneficial. This collection of clinical manifestations, including renal failure, thrombocytopenia, and microangiopathic hemolytic anemia (MAHA) is called hemolytic uremic syndrome (HUS).

Incorrect Answers: B, C, D, and E.

Giardia lamblia (Choice B) infection causes chronic, foul-smelling explosive diarrhea but does not result in bloody diarrhea, MAHA, or thrombocytopenia.

Salmonella typhi (Choice C) infection causes enteric fever, which presents with fever, bacteremia, and rose-colored spots on the chest and abdomen. Pulse-temperature dissociation in which patients with fever present with bradycardia is frequently seen.

Shigella sonnei (Choice D) most commonly causes a self-limited gastroenteritis but may also cause dysentery. It is a far less common cause of HUS than STEC.

Staphylococcus aureus (Choice E) can cause food poisoning when ingested as a result of pre-formed toxin, but it usually presents with nausea and vomiting, not with bloody diarrhea.

Educational Objective: Shiga-toxin producing *Escherichia coli* can lead to hemolytic uremic syndrome, which presents with acute renal failure, microangiopathic hemolytic anemia, and thrombocytopenia. Treatment is typically supportive.

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18. A 26-year-old nulligravid woman comes to the clinic because of a 6-week history of a mildly painful lump in her right breast. She has no history of serious illness or operative procedures. She takes no medications. Her paternal aunt was diagnosed with invasive breast cancer at the age of 65 years and underwent successful treatment with mastectomy and chemotherapy. A well-circumscribed, mildly tender, 1.5-cm mass is palpated in the upper outer quadrant of the patient's right breast, approximately 4 cm from the nipple. No other abnormalities are noted. Which of the following is the most appropriate next step in management?

A) Excisional biopsy of the mass and axillary node dissection
B) Follow-up examination in 1 month
C) Mammography of the right breast
D) Stereotactic biopsy of the mass
E) Ultrasonography of the right breast

Correct Answer: E.

Breast masses may be benign or malignant. Benign lesions include fibroadenomas, galactoceles, fat necrosis, cysts, and abscesses, whereas the most common type of malignant lesion is invasive ductal carcinoma. Benign lesions are more commonly well-circumscribed, mobile, and occasionally tender to palpation. In contrast, malignant lesions are often poorly defined, adherent to the chest wall, nontender, and associated with overlying skin changes, although these distinctions do not always hold true. Evaluation of a breast mass first involves imaging with either mammography (if over the age of 30 years) or ultrasonography (if under the age of 30 years) to evaluate whether the palpable mass has features concerning for breast cancer, such as a spiculated margin or irregular shape. Younger women's breasts are denser and more challenging to evaluate with mammography than the breasts of older women. Therefore, the most appropriate next step in management for this patient given her age would be ultrasonography of the right breast.

Incorrect Answers: A, B, C, and D.

Excisional biopsy of the mass and axillary node dissection (Choice A) would be warranted if the mass was malignant. However, surgery to remove the mass and examine for malignancy should not occur until further evaluation with imaging has been completed. Imaging may show a simple, benign mass, making surgery unnecessary.

Follow-up examination in 1 month (Choice B) would be inappropriate without further evaluation to determine if this mass is benign or malignant. If the mass is malignant

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E) Ultrasonography of the right breast

Correct Answer: E.

Breast masses may be benign or malignant. Benign lesions include fibroadenomas, galactoceles, fat necrosis, cysts, and abscesses, whereas the most common type of malignant lesion is invasive ductal carcinoma. Benign lesions are more commonly well-circumscribed, mobile, and occasionally tender to palpation. In contrast, malignant lesions are often poorly defined, adherent to the chest wall, nontender, and associated with overlying skin changes, although these distinctions do not always hold true. Evaluation of a breast mass first involves imaging with either mammography (if over the age of 30 years) or ultrasonography (if under the age of 30 years) to evaluate whether the palpable mass has features concerning for breast cancer, such as a spiculated margin or irregular shape. Younger women's breasts are denser and more challenging to evaluate with mammography than the breasts of older women. Therefore, the most appropriate next step in management for this patient given her age would be ultrasonography of the right breast.

Incorrect Answers: A, B, C, and D.

Excisional biopsy of the mass and axillary node dissection (Choice A) would be warranted if the mass was malignant. However, surgery to remove the mass and examine for malignancy should not occur until further evaluation with imaging has been completed. Imaging may show a simple, benign mass, making surgery unnecessary.

Follow-up examination in 1 month (Choice B) would be inappropriate without further evaluation to determine if this mass is benign or malignant. If the mass is malignant, increased spread or distant metastases could occur in the span of 1 month, raising the morbidity and mortality associated with the cancer.

Mammography of the right breast (Choice C) would be less useful for initial evaluation of the mass than ultrasonography in this patient because young patients often have breasts that are too dense for accurate evaluation with mammography. However, mammography is used as a follow-up imaging modality if the ultrasonography is indeterminate or suspicious for malignancy.

Stereotactic biopsy of the mass (Choice D) is not warranted at this time. While it may be necessary in order to determine the cause of the mass, further characterization of the mass with ultrasonography should occur first.

Educational Objective: Breast masses in young patients may be benign or malignant. Initial evaluation of these masses in patients under 30 years of age should begin with ultrasonography, which may be followed by mammography for further characterization.

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19. A 32-year-old man who is in the US Marine Corps is being discharged from the hospital after sustaining injuries 2 weeks ago in Southwest Asia when a rocket exploded a few yards away from him. He sustained fragmentation wounds to the right upper extremity, abdomen, and lower extremities bilaterally. At the time of injury, he received a dose of tetanus toxoid and underwent debridement and irrigation of his soft tissue wounds. Exploratory laparotomy showed a hepatic laceration and splenic laceration requiring splenectomy. He has no other history of major medical illness and takes no medications. He does not smoke. He drinks four 12-oz beers every weekend. Today, he reports no concerns. Vital signs are within normal limits. Physical examination shows a well-healing midline abdominal incision and well-healing wounds over the right upper and lower extremities. Which of the following is the most appropriate vaccination for this patient at this time?

A) Hepatitis B
B) Meningococcal conjugate
C) Tetanus immune globulin
D) Tetanus-diphtheria-acellular pertussis (Tdap)
E) Trivalent influenza

Correct Answer: B.

Meningococcal conjugate vaccination is the most appropriate vaccine for this patient who recently underwent splenectomy. Patients who are functionally or anatomically asplenic are at a higher risk than the general population for invasive infections from encapsulated bacteria such as *Neisseria meningitidis*. There are two primary types of meningococcal vaccines that are routinely given to patients without a spleen: a quadrivalent vaccine (conjugate) and one against serotype B. The conjugate vaccine must be given every 5 years to maintain immunity. Other recommended vaccinations include the pneumococcal vaccines (PCV13 and PPSV23), annual influenza vaccine, and the vaccine against *Haemophilus influenzae* type b (Hib).

Incorrect Answers: A, C, D, and E.

Hepatitis B (Choice A) vaccine is indicated for all patients regardless of whether or not they have a spleen. Most individuals receive this series of vaccines as children and do not require revaccination.

Tetanus immune globulin (Choice C) is only required for patients who have not received at least three tetanus toxoid vaccines in the past and have a [illegible]

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B) Meningococcal conjugate

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Correct Answer: B.

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Incorrect Answers: A, C, D, and E.

Hepatitis B (Choice A) vaccine is indicated for all patients regardless of whether or not they have a spleen. Most individuals receive this series of vaccines as children and do not require revaccination.

Tetanus immune globulin (Choice C) is only required for patients who have not received at least three tetanus toxoid vaccines in the past and have a grossly dirty wound. Additionally, tetanus immune globulin should be given at the time of injury, not several weeks later.

Tetanus-diphtheria-acellular pertussis (Tdap) (Choice D) is unnecessary in this patient as he already received the tetanus vaccine at the time of his initial injury.

Trivalent influenza (Choice E) is incorrect. This patient should receive the seasonal influenza vaccine when available, but the newer influenza vaccines are typically quadrivalent, not trivalent.

Educational Objective: Patients with functional or anatomic asplenia from trauma, such as this patient, should receive available vaccines that protect against encapsulated bacteria. Among these vaccines are the pneumococcal, Hib, and meningococcal conjugate vaccines.

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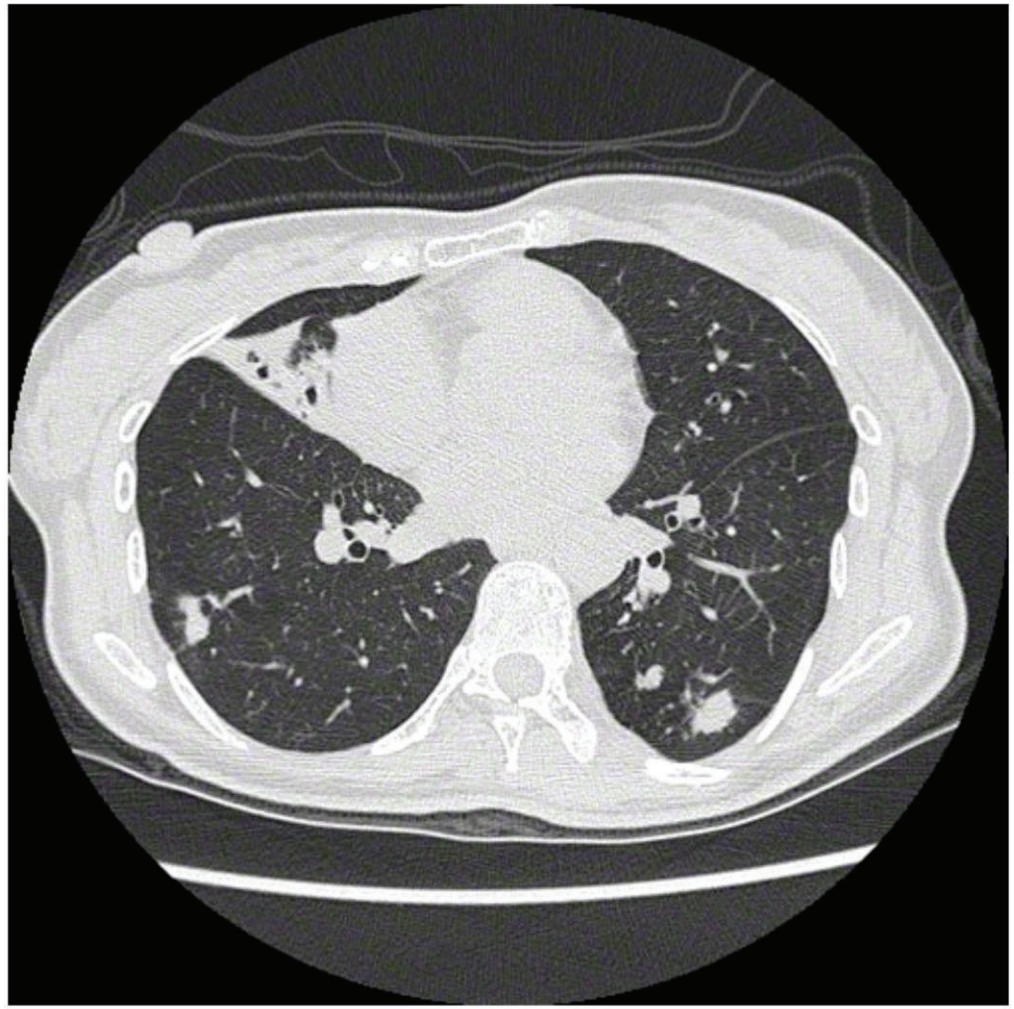

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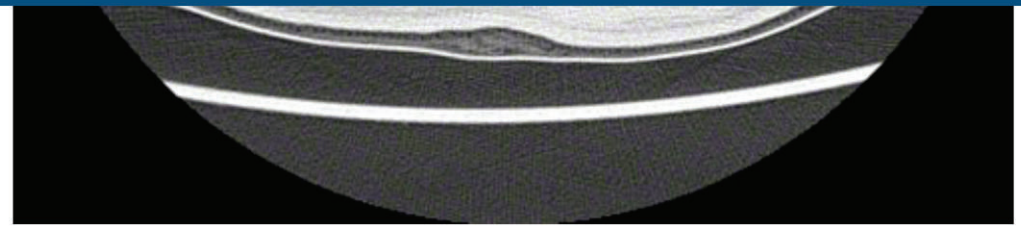

20. A 55-year-old woman comes to the office because of a 6-month history of cough productive of yellow sputum and a 1-week history of intermittent bloody streaks in her sputum. She also reports occasional night sweats during the past 3 months and an unintentional weight loss of 4.5 kg (10 lb) during the past year. She has not had fever, chills, chest pain, or shortness of breath. Medical history is notable for scoliosis and gastroesophageal reflux disease. Her only medication is omeprazole. She does not smoke cigarettes. She is 155 cm (5 ft 1 in) tall and weighs 40 kg (88 lb); BMI is 17 kg/m^2. Temperature is 36.5°C (97.7°F), pulse is 102/min, respirations are 18/min, and blood pressure is 110/61 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Auscultation of the lungs shows inspiratory crackles in the anterior right mid lung field. Musculoskeletal examination shows marked scoliosis. The remainder of the examination shows no abnormalities. X-ray of the chest shows multiple nodules in the left lower lobe. CT scan of the chest is shown. Which of the following is the most appropriate next step in management?

A) Bronchial artery embolization
B) CT-guided needle biopsy of a lung nodule
C) Levofloxacin therapy
D) Sputum stain for acid-fast bacilli
E) Thorascopic lobectomy

Correct Answer: D.

Mycobacterium avium complex (MAC) refers to a group of nontuberculous mycobacterial species that cause disease in humans. Disseminated disease is associated with immunosuppressed conditions such as AIDS. Immunocompetent patients may also suffer pulmonary MAC disease, especially in the setting of prior known or unknown lung injury. This most commonly occurs in nonsmoking women over the age of 50 with evidence of bronchiectasis, as seen in the patient's CT scan (dilated bronchioles with thickened walls). The patient's scoliosis and history of reflux are the likely causes of her bronchiectasis, which results in a platform amenable to virulent MAC infection,

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B) CT-guided needle biopsy of a lung nodule

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D) Sputum stain for acid-fast bacilli

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Mycobacterium avium complex (MAC) refers to a group of nontuberculous mycobacterial species that cause disease in humans. Disseminated disease is associated with immunosuppressed conditions such as AIDS. Immunocompetent patients may also suffer pulmonary MAC disease, especially in the setting of prior known or unknown lung injury. This most commonly occurs in nonsmoking women over the age of 50 with evidence of bronchiectasis, as seen in the patient's CT scan (dilated bronchioles with thickened walls). The patient's scoliosis and history of reflux are the likely causes of her bronchiectasis, which results in a platform amenable to virulent MAC infection, as well as other bacterial pneumonias. MAC organisms are obtained through exposure to the environment, and not person-to-person transmission. Patients typically present with persistent cough, night sweats, weight loss, and hemoptysis, similar to pulmonary tuberculosis. The best next step in management is confirmation of the diagnosis with sputum stain for acid-fast bacilli, with a sample sent for mycobacterial culture as well. Consistent chest imaging findings typically include underlying bronchiectasis, as well as scattered small nodules in the middle and lower lung lobes.

Incorrect Answers: A, B, C, and E.

Bronchial artery embolization (Choice A) is an invasive therapeutic procedure utilized in the treatment of massive hemoptysis. Massive hemoptysis is defined as greater than 500 mL of blood produced over 24 hours or greater than 100 mL per hour (definitions vary by source). Intermittent bloody streaks in the sputum are common with mycobacterial infections and do not require aggressive hemostatic control.

CT-guided needle biopsy of a lung nodule (Choice B) may provide additional diagnostic information to evaluate for malignancy or infectious agents if the sputum stain and culture are negative for acid-fast bacilli. Less invasive diagnostic measures should be utilized first.

Levofloxacin therapy (Choice C) is an appropriate empiric antibiotic choice for community-acquired bacterial pneumonia; however, this case has several features more consistent with mycobacterial infection. Levofloxacin is not the recommended treatment.

Thoracopic lobectomy (Choice E) is indicated for biopsy and resection of lung nodules not amenable to bronchoscopic or percutaneous CT guided approaches, treatment

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Correct Answer: D.

Mycobacterium avium complex (MAC) refers to a group of nontuberculous mycobacterial species that cause disease in humans. Disseminated disease is associated with immunosuppressed conditions such as AIDS. Immunocompetent patients may also suffer pulmonary MAC disease, especially in the setting of prior known or unknown lung injury. This most commonly occurs in nonsmoking women over the age of 50 with evidence of bronchiectasis, as seen in the patient's CT scan (dilated bronchioles with thickened walls). The patient's scoliosis and history of reflux are the likely causes of her bronchiectasis, which results in a platform amenable to virulent MAC infection, as well as other bacterial pneumonias. MAC organisms are obtained through exposure to the environment, and not person-to-person transmission. Patients typically present with persistent cough, night sweats, weight loss, and hemoptysis, similar to pulmonary tuberculosis. The best next step in management is confirmation of the diagnosis with sputum stain for acid-fast bacilli, with a sample sent for mycobacterial culture as well. Consistent chest imaging findings typically include underlying bronchiectasis, as well as scattered small nodules in the middle and lower lung lobes.

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Levofloxacin therapy (Choice C) is an appropriate empiric antibiotic choice for community-acquired bacterial pneumonia; however, this case has several features more consistent with mycobacterial infection. Levofloxacin is not the recommended treatment.

Thorascopic lobectomy (Choice E) is indicated for biopsy and resection of lung nodules not amenable to bronchoscopic or percutaneous CT-guided approaches, treatment of lung cancer, treatment of recurrent pneumothorax, and management of loculated empyema. Less invasive diagnostic and therapeutic measures should be utilized first.

Educational Objective: *Mycobacterium avium* complex refers to a group of nontuberculous mycobacterial species that cause disease in humans. It should be suspected in immunocompetent patients presenting with fever, night sweats, weight loss, and hemoptysis, especially in the setting of bronchiectasis.

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21. A 25-year-old man is in the intensive care unit 2 weeks after he sustained third-degree burns over 55% of his total body surface area. He is sedated with fentanyl and midazolam, orotracheally intubated, and mechanically ventilated. He has undergone five skin grafting procedures since admission. His burns are 45% covered. He has not had any infection. Pulse is 110/min, and blood pressure is 105/62 mm Hg. Examination shows no abnormalities of the head or neck. There are clean, dry bandages over the chest, abdomen, and lower extremities. Which of the following is the most appropriate next step in management of this patient's airway?

A) Change the orotracheal intubation tube every 3 days
B) Switch to a laryngeal mask airway
C) Switch to nasotracheal intubation
D) Switch to a tracheostomy tube
E) No change in management is indicated

Correct Answer: D.

The placement of a tracheostomy is frequently recommended in patients undergoing prolonged mechanical ventilation, most commonly after 10 to 14 days. Tracheostomy tubes can often be beneficial to both the patient and healthcare staff caring for the patient. They are associated with an improved work of breathing, easier ventilator weaning, improved patient satisfaction and communication, decreased sedation needs, decreased risk for laryngeal injury, and increased comfort and mobility. Complications include surgical site infection, scarring, tracheal stenosis and malacia, tracheoarterial fistula, and hypoxemia during placement. This patient has had prolonged mechanical ventilation and will likely require recurrent general anesthesia for further burn debridement; switching to a tracheostomy tube is the most appropriate next step in this patient's management.

Incorrect Answers: A, B, C, and E.

Changing the orotracheal intubation tube every 3 days (Choice A) would be inappropriate because repeated orotracheal intubation can lead to oropharyngeal and laryngeal damage. Additionally, it would require ongoing sedation and discomfort for the patient.

Switching to a laryngeal mask airway (Choice B) would not be a safe alternative for orotracheal intubation in this patient. A laryngeal mask airway does not provide a

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D) Switch to a tracheostomy tube

E) No change in management is indicated

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Changing the orotracheal intubation tube every 3 days (Choice A) would be inappropriate because repeated orotracheal intubation can lead to oropharyngeal and laryngeal damage. Additionally, it would require ongoing sedation and discomfort for the patient.

Switching to a laryngeal mask airway (Choice B) would not be a safe alternative for orotracheal intubation in this patient. A laryngeal mask airway does not provide a protected airway in a sedated patient and would put this patient at an increased risk for aspiration.

Switching to nasotracheal intubation (Choice C) would not be as useful as transitioning to a tracheostomy tube. Nasotracheal intubation would require ongoing sedation and would not prevent the laryngeal damage that can occur with prolonged tracheal intubation.

No change in management is indicated (Choice E) is incorrect because this patient has ongoing ventilatory requirements and should be transitioned to a tracheostomy tube given its clear benefits.

Educational Objective: Consideration should be given to transitioning to a tracheostomy tube in patients requiring prolonged mechanical ventilation. Benefits include an improved work of breathing, easier ventilator weaning, improved patient satisfaction and communication, decreased sedation needs, a decreased risk for laryngeal injury, and increased comfort and mobility.

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22. A 42-year-old woman comes to the office for follow-up of a renal calculus that was diagnosed in the emergency department 2 weeks ago. She passed the calculus in the emergency department after several hours of treatment with intravenous saline and pain medication. Today, she says she has not had any pain since that time. Her only medications are occasional acetaminophen and ibuprofen. She exercises three to four times weekly, follows a low-sodium diet, does not smoke cigarettes, and drinks two glasses of red wine nightly. She works as a physician. She is 170 cm (5 ft 7 in) tall and weighs 63 kg (140 lb); BMI is 22 kg/m^2. Temperature is 37.1°C (98.8°F), pulse is 72/min, respirations are 12/min, and blood pressure is 138/86 mm Hg. Physical examination discloses no abnormalities. Results of serum studies are shown:

Calcium	11.0 mg/dL
Urea nitrogen	15 mg/dL
Creatinine	0.8 mg/dL
Phosphorus	3.8 mg/dL

Results of the remainder of a basic metabolic panel and complete blood count are within the reference ranges. Which of the following is most appropriate to obtain to evaluate this patient's increased serum calcium concentration?

A) DEXA scan
B) Ionized serum calcium concentration
C) Mammography
D) Radionuclide bone scan
E) Serum parathyroid hormone concentration
F) Urinary calcium excretion

Correct Answer: E.

Measurement of serum parathyroid hormone (PTH) concentration is likely to confirm the diagnosis of primary hyperparathyroidism in this patient presenting with nephrolithiasis and hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from

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A) DEXA scan
B) Ionized serum calcium concentration
C) Mammography
D) Radionuclide bone scan
E) Serum parathyroid hormone concentration
F) Urinary calcium excretion

Correct Answer: E.

Measurement of serum parathyroid hormone (PTH) concentration is likely to confirm the diagnosis of primary hyperparathyroidism in this patient presenting with nephrolithiasis and hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from osseous resorption (osteitis fibrosa cystica), polyuria, dehydration, constipation, and psychiatric disturbances, along with hypophosphatemia, subperiosteal bone resorption, and renal failure. Hyperparathyroidism may be primary from a PTH-secreting source or secondary from increased stimulation of PTH production. Primary hyperparathyroidism is most commonly caused by a parathyroid adenoma, followed by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of PTH results in increased serum calcium from increased osteoclast activity, intestinal absorption, and renal tubular absorption. Serum phosphorus concentration may be decreased secondary to increased excretion by the renal tubules but is most often within the lower limit of normal.

Incorrect Answers: A, B, C, D, and F.

DEXA scan (Choice A) is useful for the evaluation of osteoporosis. Osteoporosis is rare in premenopausal women, and the presence of hypercalcemia in this middle-aged patient should prompt an evaluation for hyperparathyroidism.

Ionized serum calcium concentration (Choice B) measurement is useful for identifying hypercalcemia that is caused by perturbations in non-ionized calcium concentrations secondary to hyperalbuminemia, hypoalbuminemia, or hypergammaglobulinemia. Measurement of ionized serum calcium typically adds little information to the workup of patients with hypercalcemia because the vast majority of cases display an increase in ionized calcium.

Mammography (Choice C) is useful for the detection of breast carcinoma, which may lead to hypercalcemia in the setting of bony metastasis. Bony metastasis is typically accompanied by pain, which may be severe.

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nephrolithiasis and hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from osseous resorption (osteitis fibrosa cystica), polyuria, dehydration, constipation, and psychiatric disturbances, along with hypophosphatemia, subperiosteal bone resorption, and renal failure. Hyperparathyroidism may be primary from a PTH-secreting source or secondary from increased stimulation of PTH production. Primary hyperparathyroidism is most commonly caused by a parathyroid adenoma, followed by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of PTH results in increased serum calcium from increased osteoclast activity, intestinal absorption, and renal tubular absorption. Serum phosphorus concentration may be decreased secondary to increased excretion by the renal tubules but is most often within the lower limit of normal.

Incorrect Answers: A, B, C, D, and F.

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Mammography (Choice C) is useful for the detection of breast carcinoma, which may lead to hypercalcemia in the setting of bony metastasis. Bony metastasis is typically accompanied by pain, which may be severe.

Radionuclide bone scan (Choice D) is useful for the detection of osseous tumors, which may be encountered in hyperparathyroidism caused by multiple endocrine neoplasia. This patient lacks other symptoms suggestive of malignancy.

Urinary calcium excretion (Choice F) is often increased in patients with primary hyperparathyroidism but is less useful for establishing the diagnosis than measurement of parathyroid hormone concentration.

Educational Objective: Hyperparathyroidism is a common endocrine disorder. Clinical manifestations are the result of hypercalcemia, and include recurrent nephrolithiasis, bone pain, polyuria, volume depletion, constipation, and psychiatric disturbances. The diagnosis is confirmed by measurement of serum parathyroid hormone concentration.

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23. An asymptomatic 57-year-old woman comes to the physician to request a new blood test for the early detection of pancreatic cancer that she read about in a newspaper article. She is concerned about her risk because her stepmother died of pancreatic cancer at the age of 61 years. The patient has no history of serious illness and takes no medications. Examination shows no abnormalities. The physician agrees to perform the test, and the results are positive. The prevalence of pancreatic cancer in the community is 1%. The test has a sensitivity of 85% and a specificity of 90%. In a discussion of the test results with the patient, which of the following is the most appropriate explanation for her risk for pancreatic cancer?

A) She is at high risk, because of her family history
B) She is at high risk, because of the high sensitivity of the test
C) She is at high risk, because of the high specificity of the test
D) She is not at high risk, because of the low pretest probability
E) She is not at high risk, because the sensitivity and specificity are similar
F) She is not at high risk, because she has no symptoms

Correct Answer: D.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Positive predictive value (PPV) and negative predictive value (NPV) are statistical measures that define the proportion of positive and negative test results that are true positives (positive tests in patients who have the condition) and true negatives (negative tests in patients without the condition), respectively. PPV and NPV are appropriate metrics to reference when counseling a patient who has received a test result. Both PPV and NPV vary with disease prevalence, or pretest probability; PPV varies directly with prevalence whereas NPV varies inversely with prevalence, therefore, the prevalence of a disease must be known in order to interpret the PPV of the test. In this case, the prevalence of pancreatic cancer in the patient's community is only 1%. Thus, the patient's pretest probability of having pancreatic cancer is low and the predictive value of her positive test is also low. Even with a positive test result, because of the low PPV caused by her low pretest probability, she is not at high risk for truly having pancreatic cancer, and this likely represents a false positive test.

Incorrect Answers: A, B, C, E, and F.

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have the condition) and true negatives (negative tests in patients without the condition), respectively. PPV and NPV are appropriate metrics to reference when counseling a patient who has received a test result. Both PPV and NPV vary with disease prevalence, or pretest probability; PPV varies directly with prevalence whereas NPV varies inversely with prevalence, therefore, the prevalence of a disease must be known in order to interpret the PPV of the test. In this case, the prevalence of pancreatic cancer in the patient's community is only 1%. Thus, the patient's pretest probability of having pancreatic cancer is low and the predictive value of her positive test is also low. Even with a positive test result, because of the low PPV caused by her low pretest probability, she is not at high risk for truly having pancreatic cancer, and this likely represents a false positive test.

Incorrect Answers: A, B, C, E, and F.

She is at high risk, because of her family history (Choice A) is incorrect because she does not have a biologic relative with pancreatic cancer. While her stepmother died of pancreatic cancer, this does not represent true family history of the disease as she is not biologically related to her stepmother.

She is at high risk, because of the high sensitivity of the test (Choice B) is incorrect as sensitivity indicates the proportion of people with the disease who test positive. Sensitivity can thus be used to rule out disease but is less helpful in interpreting a patient's risk for disease who had a positive test.

She is at high risk, because of the high specificity of the test (Choice C) is incorrect. While a high specificity of a test indicates a low false positive rate, the specificity and sensitivity of a test are best applied on a population level. When an individual's own result is being considered, the PPV or NPV, both of which are impacted by pretest probability, are better suited to counseling the patient about their result.

Whether or not the sensitivity and specificity are similar (Choice E) does not dictate whether an individual with a positive test is at high risk for having the disease.

She is not at high risk, because she has no symptoms (Choice F) is incorrect as cancer screening tests are intended to diagnose malignancy before symptoms are present. Thus, just because she has no symptoms does not mean that she does not have the disease. It is the low pretest probability of pancreatic cancer that makes her low risk.

Educational Objective: Positive predictive value and negative predictive value are statistical measures that define the proportion of positive and negative test results that are true positives and true negatives, respectively. Both PPV and NPV vary with disease pretest probability (or prevalence), thus the pretest probability of the disease of interest must be known to interpret PPV or NPV.

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24. A 37-year-old woman comes to the physician with her husband because she has been unable to conceive for 13 months. They each have one child from previous marriages. The patient reports that menses have been occurring at irregular 4-month intervals during the past year. Her last menstrual period was 3 months ago. She has no history of gynecologic illness or abnormal Pap smears. She takes no medications. She exercises regularly but says that she has had a 4.5-kg (10-lb) weight gain during the past 2 years. She appears well nourished. She is 168 cm (5 ft 6 in) tall and weighs 70 kg (154 lb); BMI is 25 kg/m^2. Physical examination shows no hirsutism or galactorrhea. Pelvic examination shows no abnormalities. A urine pregnancy test is negative. Basal body temperature charts show a monophasic pattern. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of serum estradiol concentration
B) Measurement of serum thyroid-stimulating hormone concentration
C) Semen analysis
D) Hysterosalpingography
E) Laparoscopy

Correct Answer: B.

Anovulation can be caused by thyroid disorders, such as hypothyroidism or hyperthyroidism, as well as pregnancy, polycystic ovarian syndrome, abnormalities or immaturity of the hypothalamic-pituitary-ovarian axis, menopause or premature ovarian failure, inadequate nutrition, and chromosomal abnormalities. Anovulation often presents with irregular, heavy menstrual periods and is associated with a monophasic basal body temperature. It is commonly associated with infertility, given the paucity of ovulatory cycles available for egg fertilization. This patient likely has underlying hypothyroidism given her recent weight gain despite regular exercise. Other presenting symptoms include fatigue, constipation, cold intolerance, bradycardia, dry skin, and delayed relaxation of deep tendon reflexes. In contrast, hyperthyroidism, which can also cause anovulation, presents with heat intolerance, palpitations, weight loss, diaphoresis, and diarrhea. In order to further evaluate this patient's thyroid function, measurement of serum thyroid-stimulating hormone concentration should be obtained. Other causes of infertility include premature ovarian failure, fallopian tube blockage or scarring, sperm hypo- or immotility, inability of sperm to penetrate the corona radiata of the ovum, and structural abnormalities of the uterus.

Incorrect Answers: A, C, D, and E.

Measurement of serum estradiol concentration (Choice A) can be used to evaluate for the presence of premature ovarian failure or menopause, which may also contribute

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Incorrect Answers: A, C, D, and E.

Measurement of serum estradiol concentration (Choice A) can be used to evaluate for the presence of premature ovarian failure or menopause, which may also contribute to oligomenorrhea and infertility. However, with this patient's recent weight gain, hypothyroidism is a more likely cause of her infertility.

Semen analysis (Choice C) is often utilized in the evaluation of infertility. This patient's partner previously had a child, making a semen analysis less likely to determine the cause of the infertility.

Hysterosalpingography (Choice D) can be used to evaluate the endometrial cavity and fallopian tubes for anatomic abnormalities, such as fibroids or polyps, or fallopian tube obstruction. Many of these pathologies would not cause oligomenorrhea. Additionally, this is an invasive procedure, and noninvasive laboratory testing should occur first.

Laparoscopy (Choice E) may be used to identify structural abnormalities of the uterus or investigate for evidence of endometriosis, which may contribute to infertility. However, laparoscopy is an invasive surgical procedure and less invasive testing, such as laboratory studies, should occur first.

Educational Objective: Thyroid disorders, such as hypothyroidism or hyperthyroidism, can cause anovulation and infertility. Hypothyroidism commonly presents with weight gain, fatigue, constipation, cold intolerance, bradycardia, dry skin, and delayed relaxation of deep tendon reflexes, whereas hyperthyroidism presents with heat intolerance, palpitations, weight loss, diaphoresis, and diarrhea. Diagnosis is made with measurement of the thyroid-stimulating hormone concentration.

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25. A 42-year-old man with anemia comes to the physician for a follow-up examination. Physical examination shows no abnormalities. Laboratory studies show:

Hematocrit	28%
Mean corpuscular volume	62 μm^3
Leukocyte count	8000/mm^3
Reticulocyte count	5%
Platelet count	150,000/mm^3
Serum bilirubin	2.7 mg/dL

Hemoglobin electrophoresis shows:

Hemoglobin A	35% (N=95%–98%)
Hemoglobin A_2	6% (N=2%–4%)
Hemoglobin F	59% (N=0%–2%)

A blood smear shows numerous nucleated erythrocytes with marked anisopoikilocytosis. Which of the following is the most likely diagnosis?

A) Glucose 6-phosphate dehydrogenase deficiency
B) Hereditary spherocytosis
C) Iron deficiency anemia
D) Sickle cell disease
E) Thalassemia intermedia

Correct Answer: E.

Thalassemia intermedia is the most likely diagnosis in this patient with microcytic anemia and with a hemoglobin electrophoresis that shows decreased concentration of hemoglobin A and increased concentration of hemoglobin F (fetal hemoglobin). Thalassemia can occur in a variety of forms, and manifestations depend on the number of

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Correct Answer: E.

Thalassemia intermedia is the most likely diagnosis in this patient with microcytic anemia and with a hemoglobin electrophoresis that shows decreased concentration of hemoglobin A and increased concentration of hemoglobin F (fetal hemoglobin). Thalassemia can occur in a variety of forms, and manifestations depend on the number of allele deletions or mutations, and whether these mutations affect the α-globin or β-globin alleles. The fact that this patient has decreased concentrations of hemoglobin A (α_2–β_2) and increased concentrations of hemoglobin F (α_2–γ_2) suggests a deficiency in production of β-globin chains, which is consistent with β-thalassemia. Given that there are only two β-globin alleles, deletion or mutation of one of these genes (or regulatory elements) can lead to a profound reduction in β-globin, causing microcytic anemia (β-thalassemia intermedia). Mutations in both alleles, on the other hand, results in near absence of β-globin and leads to profound, transfusion-dependent anemia in addition to physical features that suggest extramedullary hematopoiesis, such as frontal bossing (thalassemia major). β-thalassemia minor (trait) is the inheritance of one deleted or mutated allele, but the remaining normal allele is sufficient to produce the beta chain, and patients are generally asymptomatic. Treatment for thalassemia intermedia is supportive, and most patients do not routinely require blood transfusions.

Incorrect Answers: A, B, C, and D.

Glucose 6-phosphate dehydrogenase (G6PD) deficiency (Choice A) results from a mutation in the G6PD gene leading to a reduced concentration of G6PD. This enzyme is essential for combating oxidative stress in erythrocytes, so deficiency can result in hemolytic anemia when patients are exposed to certain medications (such as sulfa antibiotics) that cause oxidative damage. Patients will have a normal hemoglobin electrophoresis.

Hereditary spherocytosis (Choice B) commonly results from mutations in erythrocyte membrane proteins such as ankyrin and spectrin, which link the inner membrane skeleton to the outer lipid bilayer. Patients present with normocytic anemia, spherocytosis on peripheral blood smear, and sometimes with hemolytic anemia and splenomegaly. Patients will have a normal hemoglobin electrophoresis.

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Iron deficiency anemia (Choice C) presents with microcytic anemia and a normal hemoglobin electrophoresis. It may result from chronic gastrointestinal blood loss or from heavy menstrual bleeding in women.

Sickle cell disease (Choice D) results from a single amino acid substitution in the β-globin gene that leads to production of an abnormally shaped β-globin molecule and formation of abnormal hemoglobin S (HbS), which polymerizes abnormally in hypoxic patients and causes sickling of erythrocytes. Hemoglobin electrophoresis will show an increased concentration of hemoglobin F but will also reveal HbS.

Educational Objective: There are two β-globin alleles, with one inherited from each parent. Mutation or deletion of one allele produces a mild disease called β-thalassemia intermedia, while deletions or mutations of both alleles cause β-thalassemia major, which is characterized by severe anemia from ineffective erythropoiesis and hemolysis. Patients with thalassemia intermedia will have a decreased concentration of hemoglobin A and an increased concentration of hemoglobin F in addition to microcytic anemia.

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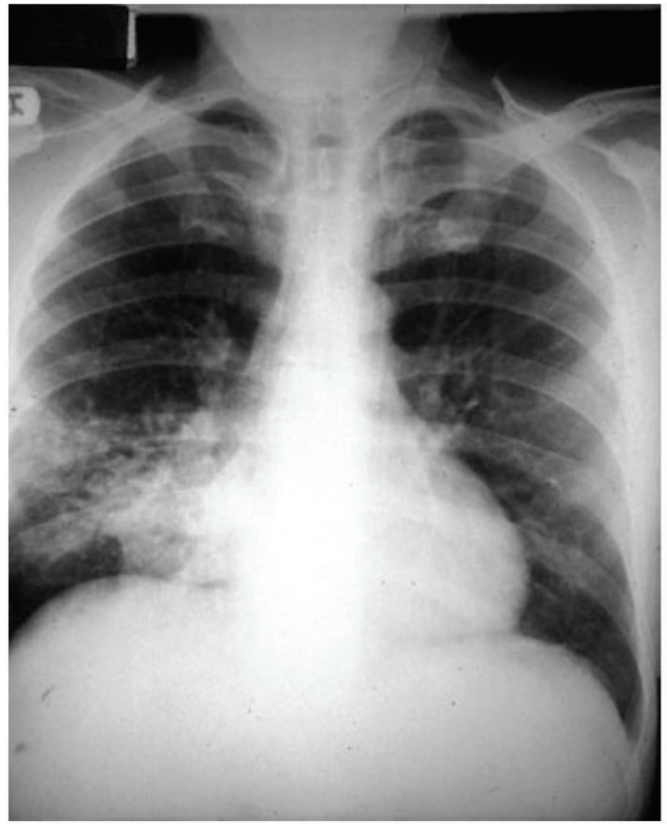
26. A 24-year-old man comes to the physician because of a 1-week history of worsening cough productive of scant yellowish sputum. He smokes marijuana daily but does not use tobacco or alcohol. He had asthma in childhood but has not required any medication for more than 10 years. He has sickle cell trait. His temperature is 38°C (100.5°F), pulse is 80/min, respirations are 18/min, and blood pressure is 120/75 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 96%. Examination shows a persistent cough and moist oral mucosa. Crackles are heard in the right middle lung field. Cardiac and abdominal examinations show no abnormalities. His hemoglobin concentration is 14 g/dL, leukocyte count is 12,000/mm^3, and platelet count is 580,000/mm^3. An x-ray of the chest is shown. Which of the following is the most appropriate pharmacotherapy?



A) Oral azithromycin
B) Oral cephalexin
C) Intravenous ampicillin
D) Intravenous ampicillin-sulbactam
E) Intravenous ceftazidime

Correct Answer: A.

Oral azithromycin is the most appropriate pharmacotherapy for this patient with a clinical syndrome consistent with community-acquired pneumonia (CAP). CAP can be diagnosed in an ambulatory patient who presents with fever, productive cough, and an identifiable pulmonary infiltrate on chest x-ray. CAP is frequently caused by a handful of bacteria including *Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis, Mycoplasma pneumoniae, Staphylococcus aureus* and *Chlamydophila pneumoniae* among others, so antibiotics are selected to cover these organisms. CAP can also be caused by respiratory viruses. For patients without

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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Oral cephalexin (Choice B) is an inappropriate antibiotic choice for CAP. It is more frequently used to treat skin and soft tissue infections as the spectrum of antimicrobial activity is more suited to the treatment of *Staphylococcal species* and *Streptococcus pyogenes* among other common skin flora.

Intravenous ampicillin (Choice C) would provide sufficient coverage against most of the common CAP pathogens, but it is unnecessary as this patient does not have severe pneumonia and likely does not require hospitalization. Similarly, intravenous ampicillin-sulbactam (Choice D) would provide adequate coverage but is unnecessary.

Intravenous ceftazidime (Choice E) is a third-generation cephalosporin with activity against many aerobic gram-negative pathogens. It is unnecessarily aggressive pharmacotherapy for this patient.

Educational Objective: CAP is characterized by the triad of fever, cough, and a pulmonary infiltrate on chest imaging. For outpatients without severe disease and no significant medical comorbidities, treatment with oral azithromycin, doxycycline, or amoxicillin is appropriate.

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27. A 14-year-old boy is brought to the physician because his parents are concerned that he is much shorter than his peers. He feels well. On questioning, he reports that he has not had constipation, dry skin, or urinary frequency. He has no history of serious illness. There is no family history of growth abnormalities. His mother is 160 cm (5 ft 3 in) tall, and his father is 173 cm (5 ft 8 in) tall. The patient is just below the 3rd percentile for height and weight and at the 50th percentile for BMI. Review of his growth chart shows he has been growing parallel to but below the 3rd percentile since the age of 2 years. On examination, the thyroid gland is barely palpable and appears normal. Genital and pubic hair development are Tanner stage 1. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Constitutional growth delay
B) Familial short stature
C) Growth hormone deficiency
D) Hypothyroidism
E) Type 1 diabetes mellitus

Correct Answer: A.

This patient's most likely diagnosis is constitutional growth delay, which is a normal variant of growth. Short stature has a variety of causes, such as constitutional growth delay, familial (hereditary) short stature, chronic steroid use, endocrine abnormalities (eg, hypothyroidism, adrenal insufficiency), cardiopulmonary disease, and genetic disorders (eg, Down syndrome, Turner syndrome). Familial short stature and constitutional growth delay are the most common causes of short stature. Familial short stature is associated with short stature in both parents, a normal gain of height velocity, and a bone age that corresponds with chronological age, whereas a constitutional growth delay is independent of parental stature, has a consistently decreased growth velocity, and a bone age younger than the patient's chronological age. Patients with constitutional growth delay may experience a delayed onset of puberty. These patients typically reach a normal adult height, with more rapid increases in height gain velocity as they progress through puberty. This patient has parents with normal stature and has demonstrated a low growth velocity, leading to a height that is consistently in the 3rd percentile (since the range of heights increases with age, a weight that is stably in the 3rd percentile reflects a low growth velocity compared to other children). This patient does not demonstrate other signs or symptoms to suggest a pathologic cause of short stature, making constitutional growth delay the most likely diagnosis.

Incorrect Answers: B, C, D, and E.

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disorders (eg, Down syndrome, Turner syndrome). Familial short stature and constitutional growth delay are the most common causes of short stature. Familial short stature is associated with short stature in both parents, a normal gain of height velocity, and a bone age that corresponds with chronological age, whereas a constitutional growth delay is independent of parental stature, has a consistently decreased growth velocity, and a bone age younger than the patient's chronological age. Patients with constitutional growth delay may experience a delayed onset of puberty. These patients typically reach a normal adult height, with more rapid increases in height gain velocity as they progress through puberty. This patient has parents with normal stature and has demonstrated a low growth velocity, leading to a height that is consistently in the 3rd percentile (since the range of heights increases with age, a weight that is stably in the 3rd percentile reflects a low growth velocity compared to other children). This patient does not demonstrate other signs or symptoms to suggest a pathologic cause of short stature, making constitutional growth delay the most likely diagnosis.

Incorrect Answers: B, C, D, and E.

Familial short stature (Choice B) typically presents in young patients whose parents are both of short stature with a normal growth velocity and bone age consistent with chronological age. These patients will remain of short stature into adulthood. This patient has parents with normal stature, making this answer less likely.

Growth hormone deficiency (Choice C) is a rare condition that can present in infancy or childhood depending on the severity of deficiency. Acquired growth hormone deficiency is typically caused by a non-functional pituitary tumor and presents with severe growth delay and a bone age younger than chronological age. It is associated with a rapid decline in the height-for-age curve, crossing percentiles. This patient's growth velocity has been slow but consistent, making growth hormone deficiency a less likely cause of his short stature.

Hypothyroidism (Choice D) is commonly associated with short stature. However, patients are likely to endorse other symptoms of hypothyroidism such as fatigue, cold intolerance, weight gain, constipation, and dry skin. As well, this patient's short stature began at an early age, which implies a chronic process. This patient does not have a history of a chronic illness such as hypothyroidism.

In type 1 diabetes mellitus (Choice E), glucosuria can lead to a caloric deficit and consequent short stature. However, this patient does not have symptoms of type 1 diabetes mellitus such as polydipsia or polyuria. As well, this patient's short stature began at an early age, which implies a chronic process.

Educational Objective: Constitutional growth delay is a normal growth variant that occurs in patients with parents of normal stature and presents with short stature, delayed pubertal development, slow but consistent growth velocity, and a bone age less than chronological age. It is associated with normal development and stature once the patient reaches puberty.

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28. A 25-year-old primigravid woman at 20 weeks' gestation comes to the physician because of a 3-week history of feeling flushed and shaking of her hands. She has been crying frequently, and her husband has told her that she seems more irritable. Her pregnancy had been uncomplicated. She has had a 4.5-kg (10-lb) weight loss since her last examination 4 weeks ago. Her temperature is 37.8°C (100°F), pulse is 115/min, and blood pressure is 145/90 mm Hg. Her skin is smooth, moist, and velvety to the touch. Examination shows a small, diffuse, smooth, soft goiter. There is a fine continuous tremor bilaterally. Her serum free thyroxine concentration is 14.2 ng/dL, and serum thyroid-stimulating hormone concentration is less than 0.002 μU/mL. Which of the following is the most appropriate initial step in management?

A) Administration of antithyroid medications
B) Administration of oral saturated solution of potassium iodide
C) Initiation of ^{131}I therapy
D) External-beam radiation therapy to the thyroid
E) Thyroidectomy

Correct Answer: A.

Hyperthyroidism in pregnancy is often caused by human chorionic gonadotropin (hCG)-mediated hyperthyroidism and Graves disease. Though some patients may present with subtle symptoms, overt hyperthyroidism typically presents with anxiety, emotional lability, heat intolerance, weight loss, tachycardia, palpitations, diaphoresis, diarrhea, and tremor. Both pregnant and nonpregnant patients with overt signs of hyperthyroidism should be initially started on β-adrenergic-blocker therapy for tachycardia and tremor, along with antithyroid medication to achieve euthyroidism. Thionamides (eg, propylthiouracil, methimazole) are the first-line antithyroid treatment in pregnant and nonpregnant patients. Methimazole is generally preferred, but propylthiouracil should be utilized in the first trimester of pregnancy given an association between methimazole and fetal aplasia cutis.

Incorrect Answers: B, C, D, and E.

Administration of oral saturated solution of potassium iodide (Choice B) has insufficient evidence for use as first-line hyperthyroidism treatment in pregnant patients. It may be utilized in pregnant patients who are intolerant of thionamides.

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C) Initiation of ^{131}I therapy

D) External-beam radiation therapy to the thyroid

E) Thyroidectomy

Correct Answer: A.

Hyperthyroidism in pregnancy is often caused by human chorionic gonadotropin (hCG)-mediated hyperthyroidism and Graves disease. Though some patients may present with subtle symptoms, overt hyperthyroidism typically presents with anxiety, emotional lability, heat intolerance, weight loss, tachycardia, palpitations, diaphoresis, diarrhea, and tremor. Both pregnant and nonpregnant patients with overt signs of hyperthyroidism should be initially started on β-adrenergic-blocker therapy for tachycardia and tremor, along with antithyroid medication to achieve euthyroidism. Thionamides (eg, propylthiouracil, methimazole) are the first-line antithyroid treatment in pregnant and nonpregnant patients. Methimazole is generally preferred, but propylthiouracil should be utilized in the first trimester of pregnancy given an association between methimazole and fetal aplasia cutis.

Incorrect Answers: B, C, D, and E.

Administration of oral saturated solution of potassium iodide (Choice B) has insufficient evidence for use as first-line hyperthyroidism treatment in pregnant patients. It may be utilized in pregnant patients who are intolerant of thionamides.

Initiation of ^{131}I therapy (Choice C) has been associated with ablation of the fetal thyroid gland and is therefore contraindicated in pregnant patients.

External-beam radiation therapy to the thyroid (Choice D) is occasionally utilized to treat certain thyroid cancers. However, hCG-mediated hyperthyroidism and Graves disease are more likely causes of hyperthyroidism in this pregnant patient.

Thyroidectomy (Choice E) is associated with maternal hypothyroidism and adverse obstetric outcomes. In patients with overt hyperthyroidism signs who cannot tolerate thionamides, thyroidectomy may be necessary, but it would not be an appropriate initial step.

Educational Objective: Both pregnant and nonpregnant patients with overt signs of hyperthyroidism should be initially started on β-adrenergic blocker therapy for tachycardia and tremor, along with antithyroid medication to achieve euthyroidism. Thionamides are first-line antithyroid medications in pregnant and nonpregnant patients.

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29. A 47-year-old woman with type 2 diabetes mellitus comes to the physician because of a 1-month history of indigestion after large meals and a 2-week history of poor exercise tolerance. She can no longer walk up one flight of stairs without becoming short of breath. She also has hypertension, hyperlipidemia, and osteoarthritis that affects both knees. Her mother had a myocardial infarction at the age of 60 years. The patient's medications are long-acting insulin, atorvastatin, enalapril, and 81-mg aspirin daily. She has never smoked cigarettes. She is 168 cm (5 ft 6 in) tall and weighs 82 kg (180 lb); BMI is 29 kg/m^2. Examination shows no abnormalities. A resting ECG shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of serum cardiac enzyme activities
B) Exercise stress test
C) Adenosine nuclear stress test
D) Echocardiography
E) Cardiac catheterization

Correct Answer: C.

Adenosine nuclear stress test is the most appropriate next step in evaluation of this patient's new onset exercise intolerance. This patient has many risk factors of coronary artery disease including type 2 diabetes mellitus, hypertension, and a family history of myocardial infarction in a first-degree relative. This confluence of factors places her at an intermediate level of risk, and she should undergo further risk stratification with stress testing. There are various types of stress testing that can be conducted, and each has benefits and drawbacks. Exercise stress testing on a treadmill is appropriate for patients with normal resting ECGs and an ability to exercise. This patient's bilateral knee osteoarthritis and inability to walk up two flights of stairs means that she will be unlikely to achieve the necessary level of exercise required for an exercise stress test. Other options include adenosine nuclear stress testing. Baseline perfusion images are taken before the administration of adenosine and compared to images obtained after the intravenous administration of adenosine. Adenosine is a potent coronary vasodilator. In patients without obstructive coronary disease, the infusion of adenosine will result in marked vasodilation and increased perfusion throughout the heart. On the other hand, patients with obstructive coronary disease typically have coronary arteries that are near maximally dilated at a point distal to the obstruction, so administration of adenosine will result in little to no increase in perfusion distal to the obstruction.

Incorrect Answers: A, B, D, and E.

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Incorrect Answers: A, B, D, and E.

Measurement of serum cardiac enzyme activities (Choice A) such as troponin or creatine kinase is indicated for patients who are suspected of having acute coronary syndrome, which frequently presents with acute chest pain and ECG changes.

Exercise stress test (Choice B) is often preferred over other forms of stress testing as it can provide more prognostic information for patients with possible coronary disease, but it is not useful if patients are unable to effectively exercise. This patient has exertional dyspnea and osteoarthritis, both of which are likely to interfere with her ability to achieve the necessary level of exertion required for an exercise stress test.

Echocardiography (Choice D) provides information about the ejection fraction, cardiac chamber size, and the function of the cardiac valves, but it is not a useful modality for determining if a patient has coronary artery disease. However, exercise or pharmacologic stress echocardiography is another viable stress test option.

Cardiac catheterization (Choice E) is indicated for the treatment of acute coronary syndrome and in patients with established coronary artery disease that is refractory to medical management. Cardiac catheterization at this time would be premature, although she may require catheterization if her stress test demonstrates evidence of coronary artery disease.

Educational Objective: Patients with risk factors for coronary artery disease and new symptoms such as angina or exertional dyspnea should be assessed for the presence of obstructive coronary disease by means of a stress test. For patients with a normal resting ECG who are able to exercise, an exercise stress test is preferred. For those unable to exercise or with abnormal ECGs, a pharmacologic nuclear stress test is frequently used.

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30. Seven days after he had a cerebral infarction, a 72-year-old man remains in the hospital and cannot be weaned from the ventilator. He is unable to eat or drink. He has a signed advance directive that requests withdrawal of all life support if he is unable to survive without it. Examination shows cortical blindness. The gag reflex is poor. There is expressive aphasia. The patient is able to respond to questions using nonverbal techniques. He can correctly identify the voices of family members. The physician asks the patient if he would like a tracheostomy and gastrostomy feeding tube, and the patient indicates "no" by squeezing the physician's hand twice. The patient's wife and son support his decision and request intravenous morphine to allow him "to die quickly." Which of the following is the most appropriate next step in management?

A) Ask the patient to confirm his wishes to have the ventilator support removed
B) Continue ventilator support and obtain a court order to determine competency
C) Continue ventilator support until cardiac function ceases
D) Discontinue ventilator support and abide by the family's wishes
E) Discontinue ventilator support and reconnect if adequate cardiac function continues beyond 1 hour

Correct Answer: A.

According to the ethical principle of autonomy, a patient's wishes about end-of-life care should be respected. There are several methods to determine a patient's wishes, including communicating with the patient himself if the patient has capacity, or reviewing advance directives, durable powers of attorney, and consulting with close family members. If these sources of information conflict, a capacitated patient's wishes supersede the other sources. This patient appears capacitated in that he is communicating non-verbally that he understands the situation and is making care decisions that are consistent with his previously stated values. The physician should therefore ask about the patient's preferences for ventilator support. A confirmation of his wish to remove ventilator support would be consistent with his close family's opinion and the contents of his advance directive, which would allow the team to then proceed with the withdrawal of life support.

Incorrect Answers: B, C, D, and E.

Obtaining a court order to determine competency (Choice B) may be necessary if the patient declines removal of ventilator support because this desire would conflict with his previously stated desires, and the physician would be unable to fully assess the patient's reasoning for changing his mind given his non-verbal status (his decisional

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C) Continue ventilator support until cardiac function ceases

D) Discontinue ventilator support and abide by the family's wishes

E) Discontinue ventilator support and reconnect if adequate cardiac function continues beyond 1 hour

Correct Answer: A.

According to the ethical principle of autonomy, a patient's wishes about end-of-life care should be respected. There are several methods to determine a patient's wishes, including communicating with the patient himself if the patient has capacity, or reviewing advance directives, durable powers of attorney, and consulting with close family members. If these sources of information conflict, a capacitated patient's wishes supersede the other sources. This patient appears capacitated in that he is communicating non-verbally that he understands the situation and is making care decisions that are consistent with his previously stated values. The physician should therefore ask about the patient's preferences for ventilator support. A confirmation of his wish to remove ventilator support would be consistent with his close family's opinion and the contents of his advance directive, which would allow the team to then proceed with the withdrawal of life support.

Incorrect Answers: B, C, D, and E.

Obtaining a court order to determine competency (Choice B) may be necessary if the patient declines removal of ventilator support because this desire would conflict with his previously stated desires, and the physician would be unable to fully assess the patient's reasoning for changing his mind given his non-verbal status (his decisional capacity would be called into question). However, if he confirms his wishes to remove the ventilator, consistent with his prior wishes, the physician can assume the patient is capacitated to make the decision.

Continuing ventilator support until cardiac function ceases (Choice C) or discontinuing ventilator support and reconnecting if adequate cardiac function continues beyond 1 hour (Choice E) would violate this patient's previously stated wishes and neglect to assess the patient's current wishes.

Discontinuing ventilator support according to the family's wishes (Choice D) neglects to assess the patient's current wishes, which typically supersede previously stated wishes or family members' wishes.

Educational Objective: A patient's expressed wishes about end-of-life care supersede other sources of information about these wishes such as advance directives or family members' wishes.

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31. A previously healthy 14-year-old boy is brought to the physician because of a 1-week history of a rash over his neck, back, and chest. It is not itchy or painful. He has had no other symptoms. A photograph of the lesions is shown. Which of the following is the most appropriate pharmacotherapy?

A) Topical benzoyl peroxide
B) Topical clindamycin

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A) Topical benzoyl peroxide
B) Topical clindamycin
C) Topical hydrocortisone
D) Topical mupirocin
E) Topical permethrin
F) Topical selenium sulfide
G) Oral griseofulvin

Correct Answer: F.

Tinea versicolor is a superficial infection of the epidermis caused by *Malassezia furfur*. Clinically, it is characterized by hypopigmented and hyperpigmented macules and patches with a fine scale. The infection has a predilection for sites with increased sebum production such as the chest and back. Patients commonly notice the rash after spending time outdoors because *Malassezia furfur* inhibits tanning of the affected areas, making them more noticeable when compared to the unaffected neighboring skin. A potassium hydroxide preparation of a skin scraping can be helpful and will show fungal spores and short hyphae along the edges of epidermal cells. Tinea versicolor may be treated using topical antifungal preparations including topical ketoconazole or selenium sulfide.

Incorrect Answers: A, B, C, D, E, and G.

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B) Topical clindamycin
C) Topical hydrocortisone
D) Topical mupirocin
E) Topical permethrin
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Incorrect Answers: A, B, C, D, E, and G.

Topical benzoyl peroxide (Choice A) and topical clindamycin (Choice B) are both topical therapies used in the treatment of acne vulgaris. Acne vulgaris presents with comedones, pustules, and inflammatory papules on the face, chest, and upper back. This patient has hypopigmented macules and patches instead, consistent with a diagnosis of tinea versicolor.

Topical hydrocortisone (Choice C), a corticosteroid, is used in the treatment of inflammatory dermatoses such as atopic dermatitis, or eczema. Eczema is initially characterized by erythematous papules and vesicles with exudates and crusting and, with chronic scratching, becomes dry, scaly, and excoriated in a process called lichenification. This patient's findings are more consistent with a diagnosis of tinea versicolor.

Topical mupirocin (Choice D), an antibiotic, is used in the treatment of impetigo and other superficial bacterial infections. Impetigo is a contagious bacterial skin infection on the face and extremities with lesions that progress from papules to vesicles and crusts that have a yellow, gold, or honey color.

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Incorrect Answers: A, B, C, D, E, and G.

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Topical permethrin (Choice E) is used in the treatment of scabies. Scabies presents in patients of all ages with severe itching and rash in classic areas including the finger web spaces, volar wrists, umbilicus, and genitalia.

Oral griseofulvin (Choice G) is used in the treatment of tinea capitis. Tinea capitis is a fungal infection of the scalp common in children. The most common presentation is scaly patches with alopecia, and patches of alopecia with black dots that represent broken hairs. By definition, it is present on the scalp rather than the back, as in this case.

Educational Objective: Tinea versicolor is characterized by hypopigmented and hyperpigmented macules and patches with a fine scale. It is caused by a superficial infection with the yeast *Malassezia furfur*. The infection has a predilection for sites with increased sebum production such as the chest and back. Treatment is with topical antifungal preparations including topical ketoconazole or selenium sulfide.

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32. A 17-year-old boy is brought to the emergency department 1 hour after he sustained a stab wound to his abdomen. He has no history of serious illness and takes no medications. He is alert and communicative and reports severe abdominal pain. His temperature is 37.8°C (100°F), pulse is 130/min, and blood pressure is 110/70 mm Hg. Examination shows a 2-cm, jagged laceration over the anterior abdominal wall in the left lower quadrant. Wound exploration shows penetration of the underlying fascia. Which of the following is the most appropriate next step in management?

A) CT scan of the abdomen with contrast
B) Gastrografin contrast study
C) Laparotomy
D) X-rays of the chest and abdomen
E) Observation only

Correct Answer: C.

Exploratory laparotomy involves the surgical evaluation of the peritoneal cavity and is commonly employed in the diagnosis and management of abdominal trauma, bowel obstruction, peritonitis, and undifferentiated cases of acute abdomen. In penetrating abdominal trauma, evaluation of the depth of the wound tract is quickly done to determine whether it has violated the peritoneum. Penetrating abdominal wounds can cause severe intra-abdominal injury including hemorrhage and viscus perforation. Laparotomy is indicated for any hemodynamically unstable patient (eg, tachycardia and hypotension) presenting after penetrating abdominal trauma because it permits the control of hemorrhage and the repair of identified injuries.

Incorrect Answers: A, B, D, and E.

CT scan of the abdomen with contrast (Choice A) would be helpful in diagnosing other traumatic injuries such as liver or splenic lacerations, duodenal hematoma, bowel perforation, or retroperitoneal hematoma. However, for patients who are hemodynamically unstable, a CT scan may delay diagnosis and management of intra-abdominal injuries.

Gastrografin contrast study (Choice B) can be used in the evaluation of small bowel obstruction, and it may be appropriate in certain cases of stable penetrating abdominal

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B) X-rays of the chest and abdomen

E) Observation only

Correct Answer: C.

Exploratory laparotomy involves the surgical evaluation of the peritoneal cavity and is commonly employed in the diagnosis and management of abdominal trauma, bowel obstruction, peritonitis, and undifferentiated cases of acute abdomen. In penetrating abdominal trauma, evaluation of the depth of the wound tract is quickly done to determine whether it has violated the peritoneum. Penetrating abdominal wounds can cause severe intra-abdominal injury including hemorrhage and viscus perforation. Laparotomy is indicated for any hemodynamically unstable patient (eg, tachycardia and hypotension) presenting after penetrating abdominal trauma because it permits the control of hemorrhage and the repair of identified injuries.

Incorrect Answers: A, B, D, and E.

CT scan of the abdomen with contrast (Choice A) would be helpful in diagnosing other traumatic injuries such as liver or splenic lacerations, duodenal hematoma, bowel perforation, or retroperitoneal hematoma. However, for patients who are hemodynamically unstable, a CT scan may delay diagnosis and management of intra-abdominal injuries.

Gastrografin contrast study (Choice B) can be used in the evaluation of small bowel obstruction, and it may be appropriate in certain cases of stable penetrating abdominal or flank injury without clear violation of fascia. It would be less suitable than laparotomy to evaluate for intra-abdominal trauma in a case of clear peritoneal violation and tachycardia suggestive of hemorrhage.

X-rays of the chest and abdomen (Choice D) may be helpful in the evaluation of free air, such as with suspected peptic ulcer perforation. However, in this patient whose injury penetrates underlying fascia and is borderline unstable, further imaging would delay management with exploratory laparotomy.

Observation (Choice E) could potentially be appropriate for a patient who is hemodynamically stable and with a superficial penetrating wound not violating the peritoneum. It would be inappropriate in this borderline unstable patient with a severe penetrating wound with likely intra-abdominal injury.

Educational Objective: Emergent laparotomy is indicated for hemodynamically unstable patients presenting after penetrating abdominal trauma because it permits the control of hemorrhage and the repair of identified injuries.

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33. A 16-month-old boy is brought to the physician by his parents because of a 2-day history of rash. He has not been scratching it. He has not had runny nose, watery eyes, cough, or change in appetite. There are no current known cases of measles in the community, and his family has not traveled recently. He was born at 39 weeks' gestation following an uncomplicated pregnancy and delivery. He was breast-fed for the first 6 months. He received all recommended vaccines for the first 6 months of life. His mother declined to have him receive the varicella vaccine. He received the measles-mumps-rubella vaccine 10 days ago. Growth and development are appropriate for age. On examination, he is playful and alert. His temperature is 37.7°C (99.9°F). A photograph of the rash is shown. The remainder of the examination shows no abnormalities. Which of the following is the most likely cause of this patient's rash?

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A) Chickenpox
B) Erythema infectiosum (fifth disease)
C) Replication of a live vaccine virus strain
D) Roseola (exanthema subitum)
E) Scarlet fever
F) Syphilis
G) Wild-type measles virus infection

Correct Answer: C.

This patient has developed a morbilliform rash caused by the replication of the measles strain contained in the live measles, mumps, and rubella (MMR) vaccine. This sequela occurs after receiving the MMR vaccine in approximately 5% of children. Measles (rubeola) virus is a highly contagious paramyxovirus that causes the disease measles, which is associated with acute febrile illness and potentially severe sequelae. It is more common in children than adults. It characteristically presents with prodromal fever, cough, coryza, conjunctivitis, and a confluent maculopapular rash that starts at the head and neck and spreads to the trunk, excluding the palms and soles. Physical examination may show bright red macules with a bluish-white center on the buccal mucosa and lymphadenopathy. Measles is prevented by immunization with the live MMR vaccine. Live attenuated vaccines are made of viable viral pathogens whose virulence has been reduced but occasionally replication of the strain contained in the vaccine can cause symptoms such as fever, transient rash, or transient joint pain. Other live attenuated vaccines include the yellow fever, intranasal influenza, smallpox, varicella-zoster, rotavirus, and the oral poliovirus vaccines. The patient lacks other clinical manifestations of true measles infection including prodromal fever, cough, coryza, conjunctivitis, and Koplik spots, so his presentation is most likely caused by replication of the measles strain contained in the live vaccine.

Incorrect Answers: A, B, D, E, F, and G.

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Incorrect Answers: A, B, D, E, F, and G.

Chickenpox (Choice A), caused by varicella-zoster virus, is marked by a pruritic, asynchronous rash with fluid-filled vesicles that crust over.

Erythema infectiosum (fifth disease) (Choice B) is caused by parvovirus B19. It presents with pink patches on the bilateral cheeks of children giving an appearance of slapped cheeks. This facial rash may be followed by a lacy, macular eruption on the trunk and extremities.

Roseola (exanthema subitum) (Choice D) is caused by human herpesvirus 6. It is characterized by several days of high fevers sometimes accompanied by seizures; as the fevers subside, a characteristic, blanching, macular eruption forms on the neck and trunk, which then spreads outward to the face and extremities.

Scarlet fever (Choice E) can present with an erythematous tongue, rash, and desquamation of hands and feet. The rash of scarlet fever is characteristically a rough, papular, diffuse body rash.

Secondary syphilis (Choice F) may present with a widespread rash which involves the palms and soles. The rash is copper-colored and scaly rather than morbilliform.

In a small subset of patients, infection with wild-type measles virus (Choice G) can occur even after immunization. This is called atypical measles and is characterized by a high, prolonged fever, rash, headache, pneumonitis, and lymphadenopathy. This patient lacks risk factors for being exposed to wild-type measles virus and does not show other findings beyond his asymptomatic rash.

Educational Objective: The MMR vaccine is an example of a live attenuated vaccine. A small subset of patients may develop transient rash, joint pain, lymphadenopathy, or fever after receiving the vaccine, which indicates replication of the viral strain contained in the vaccine. However, other features of measles infection such as cough, coryza, and conjunctivitis are absent.

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34. A 12-year-old girl is brought to the office by her mother because of a 3-month history of painless lumps around her knees and ankles. They have not affected her activity. She has not had nausea, vomiting, fever, chills, or malaise. She has no history of serious illness. Immunizations are up-to-date. Growth and development are appropriate for age. Vital signs are within normal limits. Examination shows aligned extremities. There are 10-mm and 5-mm masses palpable over the anterolateral aspect of the knees and ankles, respectively. Range of motion of the knees and ankles is full and painless. Neurovascular examination shows no abnormalities. X-rays of the knees and ankles show bony extensions corresponding to each palpated mass, appearing to originate at or near the physes. The bony extensions are well corticated with no sclerotic or lytic properties. Which of the following is the most likely diagnosis?

A) Chondroblastoma
B) Ewing sarcoma
C) Langerhans cell histocytosis
D) Osteochondroma
E) Osteoid osteoma

Correct Answer: D.

Osteochondroma is the most common benign primary tumor of bone. Benign tumors of bone can be divided into those that create osteoid, or bone, and those that create cartilage. Osteochondroma falls into the latter category along with enchondroma, chondroblastoma, and chondromyxoid fibroma. Osteochondroma is characterized by a small bony spur protruding from the surface of the bone capped by cartilage, which is what is palpable clinically, particularly when it occurs near the end of a long bone. Osteochondroma typically presents in adolescence as a painless mass near a joint, such as the knee or ankle joint, as in this patient. When multiple are present, the genetic syndrome hereditary multiple osteochondromas may be present. Functional problems, deformity caused by the effect on growth plates, or pathologic fracture may occur, but the patient may also be asymptomatic. X-ray shows a sessile or pedunculated tumor with its cortex continuous with the cortex of the underlying bone and a cartilaginous cap. Osteochondromas have a very low rate of malignant transformation and will stop growing when the growth plates close, so treatment is not always necessary. However, if the lesion is symptomatic, causing limb deformity, or growth disturbance, surgical excision is curative.

Incorrect Answers: A, B, C, and E.

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Incorrect Answers: A, B, C, and E.

Chondroblastoma (Choice A) is a benign neoplasm of cartilage which appears near the epiphyses of long bones in adolescents. Low-grade joint pain and swelling is often present, which may lead to the condition being misdiagnosed as a rheumatologic disease. On x-ray, chondroblastoma is a small, well-defined, epiphyseal lesion with a sclerotic border.

Ewing sarcoma (Choice B) is a primary bone malignancy driven by t(11;22) chromosomal translocation seen most commonly in adolescent boys. X-ray may show elevated periosteum and layered neocortex formation. It often occurs in the long bones (eg, femur, tibia) and typically presents in adolescence. On histology, Ewing sarcoma shows multiple small, round, blue cells.

Langerhans cell histiocytosis (Choice C) is caused by a malignant transformation of Langerhans cells, the specialized macrophages which reside in the skin and act as antigen-presenting cells to T-lymphocytes. Langerhans cell histiocytosis may present with different clinical syndromes depending on the underlying subtype. It typically presents in childhood or the neonatal period. Disease may affect the skin, bones, or visceral organs. Pulmonary involvement may be seen later in life.

Osteoid osteoma (Choice E) is another common benign tumor of bone. However, unlike osteochondroma, on x-ray it presents as a radiolucent bone lesion, most commonly on the proximal femur. Patients may also have pain associated with the tumor. Unlike in this case of multiple osteochondromas, osteoid osteoma is typically solitary.

Educational Objective: Osteochondroma, a benign primary tumor of bone, is characterized by a small bony spur protruding from the surface of the bone capped by cartilage, which is palpable clinically. X-ray shows a sessile or pedunculated tumor with its cortex continuous with the cortex of the underlying bone and a cartilage cap surrounding. If the lesion is symptomatic, causing limb deformity, or growth disturbance, treatment is with surgical excision.

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35. A 32-year-old man with major depressive disorder has had the sensation of insects crawling under his skin for 2 weeks. He was initially treated for scabies in the emergency department. When he went to the dermatology clinic for a follow-up examination, he was told he had herpes zoster. He has continued to use acyclovir and the topical scabies preparation prescribed, but his symptoms have worsened, and he now sees tiny worms crawling out from his skin. He appears anxious but healthy. He has scattered excoriations over his face, head, abdomen, and upper and lower extremities. The lesions are punched-out sores on a clean base. Toxicology screening is most likely to show which of the following?

A) Acetaminophen
B) Methamphetamine
C) Opiates
D) Organophosphates
E) Paraquat

Correct Answer: B.

This patient's sensation of insects crawling under his skin that does not improve with dermatologic treatment and is associated with normal-appearing skin other than excoriations is likely related to methamphetamine use. Methamphetamine and other amphetamines are central nervous system stimulants and sympathomimetics; intoxication is characterized by euphoria, grandiosity, increased wakefulness and attention, agitation, and anorexia. Because of increased synaptic dopamine, hallucinations and paranoia can occur. Patients commonly report tactile hallucinations of insects crawling under their skin. On examination, acute intoxication presents with signs of sympathomimetic toxicity including hypertension, tachycardia, tachypnea, diaphoresis, and dilated pupils. Chronic methamphetamine use can lead to a chronic psychotic disorder, cognitive impairment, weight loss, skin excoriations secondary to tactile hallucinations, and poor dentition secondary to poor nutrition, tooth grinding, and dry mouth. Treatment for acute methamphetamine intoxication is supportive, and benzodiazepines and antipsychotics have been shown to be effective for the management of agitation in these patients. Chronic methamphetamine use disorder management requires psychotherapy aimed at decreasing use.

Incorrect Answers: A, C, D, and E.

Acetaminophen (Choice A) poisoning commonly manifests as increased liver transaminases, jaundice, coagulopathy, and renal failure. Dermatologic and psychiatric

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E) Paraquat

Correct Answer: B.

This patient's sensation of insects crawling under his skin that does not improve with dermatologic treatment and is associated with normal-appearing skin other than excoriations is likely related to methamphetamine use. Methamphetamine and other amphetamines are central nervous system stimulants and sympathomimetics; intoxication is characterized by euphoria, grandiosity, increased wakefulness and attention, agitation, and anorexia. Because of increased synaptic dopamine, hallucinations and paranoia can occur. Patients commonly report tactile hallucinations of insects crawling under their skin. On examination, acute intoxication presents with signs of sympathomimetic toxicity including hypertension, tachycardia, tachypnea, diaphoresis, and dilated pupils. Chronic methamphetamine use can lead to a chronic psychotic disorder, cognitive impairment, weight loss, skin excoriations secondary to tactile hallucinations, and poor dentition secondary to poor nutrition, tooth grinding, and dry mouth. Treatment for acute methamphetamine intoxication is supportive, and benzodiazepines and antipsychotics have been shown to be effective for the management of agitation in these patients. Chronic methamphetamine use disorder management requires psychotherapy aimed at decreasing use.

Incorrect Answers: A, C, D, and E.

Acetaminophen (Choice A) poisoning commonly manifests as increased liver transaminases, jaundice, coagulopathy, and renal failure. Dermatologic and psychiatric manifestations would be atypical.

Opiate (Choice C) toxicity presents with CNS depression including sedation, respiratory depression, bradycardia, hypotension, and miosis. Patients who chronically abuse intravenous opiates may develop abscesses at injection sites, though psychotic symptoms and consequent skin excoriations would be atypical.

Organophosphate (Choice D) poisoning leads to increased cholinergic signaling, which presents with diarrhea, vomiting, urination, lethargy, altered mental status, bradycardia, miosis, salivation, lacrimation, diaphoresis, and bronchospasm. Tactile hallucinations and consequent skin excoriations would be atypical.

Paraquat (Choice E) poisoning by ingestion commonly presents with mouth pain, abdominal pain, nausea, vomiting, and a generalized burning sensation of the skin. A crawling sensation and consequent skin excoriation would be atypical.

Educational Objective: Methamphetamine use commonly results in tactile hallucinations. Chronic methamphetamine use can lead to a chronic psychotic disorder, cognitive impairment, weight loss, skin excoriations secondary to tactile hallucinations, and poor dentition.

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36. A 37-year-old woman, gravida 3, para 3, comes for a routine health maintenance examination. Physical examination shows a 3-cm, nontender, fluctuant mass involving the left posterior vulva underlying the mucosa of the vestibule and external to the hymenal ring. Which of the following is the most likely diagnosis?

A) Bartholin duct cyst
B) Episiotomy inclusion cyst
C) Mesonephric (wolffian) duct cyst
D) Sebaceous cyst
E) Vestibular gland cyst

Correct Answer: A.

A Bartholin gland is located on each side of the introitus and provides secretions that lubricate the vagina. Occasionally, the ducts of these glands become obstructed, leading to a Bartholin cyst. This presents as a small area of usually painful, fluctuant swelling over the posterior aspect of the labium majus external to the hymenal ring, as in this patient. With ongoing obstruction and inflammation, infection can develop, leading to a Bartholin gland abscess, marked by erythema and tenderness to palpation of the cyst. Abscesses are commonly polymicrobial and organisms may come from both the skin and enteric flora. If a single organism is identified, it is usually *Neisseria gonorrhoeae*, but this is not as common as a polymicrobial source. Abscesses and cysts that are three centimeters or greater in diameter are often treated with incision and drainage.

Incorrect Answers: B, C, D, and E.

Episiotomy inclusion cyst (Choice B) frequently develops within the vaginal wall following an episiotomy. They are usually asymptomatic and discovered on routine pelvic examination. This patient's mass is below the hymenal ring, making an episiotomy inclusion cyst less likely.

Mesonephric (wolffian) duct cysts (Choice C) are caused by the incomplete regression of the mesonephric ducts during embryonic development. These cysts are most commonly located lateral to the vaginal wall in the broad ligament and would not be apparent on vulvar examination.

Sebaceous cyst (Choice D) commonly present as small skin-colored nodules with a central punctum, which may become infected. They are usually firm, rather than

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D) Sebaceous cyst

E) Vestibular gland cyst

Correct Answer: A.

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Sebaceous cyst (Choice D) commonly present as small skin-colored nodules with a central punctum, which may become infected. They are usually firm, rather than fluctuant, and do not often progress to be three centimeters in size.

Vestibular gland cysts (Choice E) present with fluctuant swelling near the urethra caused by blockage of the outflow of Skene's glands. In contrast, Bartholin gland cysts occur adjacent to the introitus.

Educational Objective: A Bartholin gland cyst is an area of fluctuant swelling near the posterior introitus, caused by obstruction of a Bartholin gland duct. They can be complicated by abscess formation. Abscesses and cysts 3 centimeters in diameter or larger are typically managed with incision and drainage.

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37. An asymptomatic 47-year-old woman comes to the physician for a routine health maintenance examination. She has no history of rheumatic fever. She takes no medications. Her pulse is 70/min, and blood pressure is 150/60 mm Hg. A grade 2/6 decrescendo murmur that begins after S_2 is heard at the left sternal border. Which of the following is the most likely diagnosis?

A) Aortic valve insufficiency
B) Aortic valve stenosis
C) Mitral valve regurgitation
D) Mitral valve stenosis
E) Tricuspid valve regurgitation

Correct Answer: A.

Aortic valve insufficiency, also known as aortic regurgitation, is the result of an incompetent aortic valve. After closure of the aortic valve at the end of systole, valvular insufficiency results in retrograde flow from the aorta into the left ventricle during diastole, resulting in increased left ventricular diastolic pressure and preload. Patients may present with symptoms of left-sided cardiac volume overload, such as dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, or may be entirely asymptomatic. An early diastolic decrescendo murmur best heard in the right second intercostal space is most characteristic. Patients may also present with bisferiens carotid pulsation, in which the arterial waveform has a double systolic peak, with an initial sharp, shortened peak followed by a lower amplitude, broader peak. Aortic valve insufficiency is commonly associated with endocarditis, acute rheumatic fever, and aortic root dilation.

Incorrect Answers: B, C, D, and E.

Aortic valve stenosis (Choice B) presents with a crescendo-decrescendo systolic murmur best heard at the upper right sternal border and radiates to the carotid arteries. It classically occurs secondary to age-related fibrotic and calcific changes of the valve but can occur earlier in life in cases of bicuspid aortic valve or chronic rheumatic disease.

Mitral valve regurgitation (Choice C) presents with a holosystolic apical murmur best heard in the left fourth or fifth intercostal space along the midclavicular line and

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E) Tricuspid valve regurgitation

Correct Answer: A.

Aortic valve insufficiency, also known as aortic regurgitation, is the result of an incompetent aortic valve. After closure of the aortic valve at the end of systole, valvular insufficiency results in retrograde flow from the aorta into the left ventricle during diastole, resulting in increased left ventricular diastolic pressure and preload. Patients may present with symptoms of left-sided cardiac volume overload, such as dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, or may be entirely asymptomatic. An early diastolic decrescendo murmur best heard in the right second intercostal space is most characteristic. Patients may also present with bisferiens carotid pulsation, in which the arterial waveform has a double systolic peak, with an initial sharp, shortened peak followed by a lower amplitude, broader peak. Aortic valve insufficiency is commonly associated with endocarditis, acute rheumatic fever, and aortic root dilation.

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Mitral valve regurgitation (Choice C) presents with a holosystolic apical murmur best heard in the left fourth or fifth intercostal space along the midclavicular line and radiates to the left axilla. It is commonly associated with mitral valve prolapse and prior myocardial infarction.

Mitral valve stenosis (Choice D) is classically heard as an opening snap followed by a diastolic rumble, which is loudest over the cardiac apex and radiates to the axilla. If severe enough, it can result in left atrial enlargement, cardiogenic pulmonary edema, and arrhythmias such as atrial fibrillation and flutter.

Tricuspid valve regurgitation (Choice E) discloses a holosystolic murmur best heard in the left lower sternal border and may result from severe pulmonary hypertension or infective endocarditis in the setting of intravenous drug use.

Educational Objective: Aortic valve insufficiency is the result of an incompetent aortic valve. After closure of the aortic valve at the end of systole, valvular insufficiency results in retrograde flow from the aorta into the left ventricle during diastole, resulting in increased left ventricular diastolic pressure and preload. An early diastolic decrescendo murmur best heard in the right second intercostal space is most characteristic.

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38. A 57-year-old woman with atrial fibrillation comes to the physician because of a 2-week history of pain with urination, urinary frequency, and blood-tinged urine. She underwent hysterectomy for endometriosis at the age of 45 years. Current medications include estrogen replacement, digoxin, and warfarin. Her temperature is 36.7°C (98°F). Examination shows no abnormalities. Which of the following is the most likely diagnosis?

A) Bleeding disorder secondary to warfarin
B) Endometriosis
C) Urinary tract infection
D) Urogenital cancer
E) Urolithiasis

Correct Answer: C.

Urinary tract infections (UTIs) present with dysuria, frequency, urgency, suprapubic discomfort, and occasionally hematuria. They occur more frequently in women than in men because of a shorter urethra and favorable regional environment for bacterial growth. Risk factors include the presence of a urinary catheter, anatomic genitourinary defects, diabetes mellitus, pregnancy, and frequent or recent sexual intercourse. Urinalysis will typically show bacteriuria, white blood cells, positive leukocyte esterase, and positive nitrites depending on the infectious organism. Treatment of uncomplicated UTIs typically consists of outpatient antibiotic management with trimethoprim-sulfamethoxazole, nitrofurantoin, or cephalexin. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of feminine hygiene practices to reduce the introduction of bacteria to the urethra.

Incorrect Answers: A, B, D, and E.

A bleeding disorder secondary to warfarin (Choice A) may be caused by the narrow therapeutic window of warfarin. However, a supratherapeutic international normalized ratio would be unlikely to present with dysuria and urinary frequency.

Endometriosis (Choice B) is caused by ectopic endometrial tissue outside the uterus, and presents with chronic dysmenorrhea, dyspareunia, dyschezia, and infertility. Symptoms are typically cyclical and do not often include hematuria or dysuria.

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D) Urogenital cancer

E) Urolithiasis

Correct Answer: C.

Urinary tract infections (UTIs) present with dysuria, frequency, urgency, suprapubic discomfort, and occasionally hematuria. They occur more frequently in women than in men because of a shorter urethra and favorable regional environment for bacterial growth. Risk factors include the presence of a urinary catheter, anatomic genitourinary defects, diabetes mellitus, pregnancy, and frequent or recent sexual intercourse. Urinalysis will typically show bacteriuria, white blood cells, positive leukocyte esterase, and positive nitrites depending on the infectious organism. Treatment of uncomplicated UTIs typically consists of outpatient antibiotic management with trimethoprim-sulfamethoxazole, nitrofurantoin, or cephalexin. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of feminine hygiene practices to reduce the introduction of bacteria to the urethra.

Incorrect Answers: A, B, D, and E.

A bleeding disorder secondary to warfarin (Choice A) may be caused by the narrow therapeutic window of warfarin. However, a supratherapeutic international normalized ratio would be unlikely to present with dysuria and urinary frequency.

Endometriosis (Choice B) is caused by ectopic endometrial tissue outside the uterus, and presents with chronic dysmenorrhea, dyspareunia, dyschezia, and infertility. Symptoms are typically cyclical and do not often include hematuria or dysuria.

Urogenital cancer (Choice D) may present with hematuria, however, the hematuria associated with urogenital cancer is classically painless. Patients may also present with overflow incontinence caused by obstruction of the bladder outlet.

Urolithiasis (Choice E) may present with hematuria but is more commonly accompanied by flank pain rather than dysuria.

Educational Objective: Urinary tract infections typically present with dysuria, frequency, urgency, suprapubic discomfort, and occasionally hematuria. Prevention in women includes voiding immediately after coitus, oral hydration, and improvement in feminine hygiene practices to reduce the introduction of bacteria into the urethra. Prophylactic antibiotics are an option for recurrent UTIs that do not respond to more conservative prevention techniques.

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39. A 62-year-old woman is scheduled for discharge 3 days after admission to the hospital for a small infarction in the distribution of the left middle cerebral artery. Her presenting symptom of mild weakness of the right upper and lower extremities has gradually resolved during the past 3 days. On admission, echocardiography and ambulatory ECG monitoring showed no abnormalities. She has a 5-year history of hypertension treated with hydrochlorothiazide and atenolol. She has no other personal history of serious illness. She has never smoked. Vital signs are within normal limits. Cardiac examination shows a regular rhythm and no murmurs. Neurologic examination shows no focal findings. In addition to aspirin therapy, which of the following is the most appropriate pharmacotherapy to prevent recurrent cerebral infarction in this patient?

A) Atorvastatin
B) Vitamin B_6
C) Vitamin B_{12} (cyanocobalamin)
D) Vitamin E
E) Warfarin

Correct Answer: A.

Cerebrovascular accidents (CVAs, cerebral infarctions, strokes) are caused by ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80 to 85% of CVAs are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15 to 20% of CVAs are hemorrhagic, caused by blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Risk factors for CVAs include smoking, hypertension, diabetes mellitus, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Classically, CVAs manifest as a neurologic deficit related to the affected part of the brain. Secondary prevention of future CVAs should include smoking cessation, a healthy diet, regular exercise, hypertension treatment, blood glucose control if diabetic, and use of a statin and aspirin. Statins are HMG CoA reductase inhibitors that decrease the risk for future CVAs by reducing the development of intracranial atherosclerosis, decreasing oxidative stress, preventing inflammatory damage, and decreasing thrombogenesis. Statins have been shown to decrease the risk for future ischemic strokes and all-cause mortality.

Incorrect Answers: B, C, D, and E.

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D) Vitamin E

E) Warfarin

Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Vitamin B_6 (Choice B) is a vitamin involved in several biosynthetic processes, including gluconeogenesis. Vitamin B_{12} (cyanocobalamin) (Choice C) is a coenzyme in the metabolism of fats and carbohydrates, a regulator of protein synthesis, and a factor in cell replication and hematopoiesis. These vitamins do not play a role in secondary stroke prevention.

Vitamin E (Choice D) is a free radical scavenger. It may slightly reduce the risk for recurrent ischemic stroke, but it also increases the risk for future hemorrhagic strokes; as a result, it is not regularly utilized in secondary stroke prevention.

Warfarin (Choice E) may be utilized to prevent coagulation and consequent ischemic CVAs in patients with atrial fibrillation or mechanical heart valves. Because of its bleeding risk, it is not routinely utilized in patients without these risk factors.

Educational Objective: Secondary prevention of future CVAs should include smoking cessation, a healthy diet, regular exercise, hypertension treatment, blood glucose control if diabetic, and use of a statin and aspirin.

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40. A 42-year-old woman comes to the physician because of decreased energy, apathy, and difficulty sleeping since being fired from her job 3 weeks ago. Since then, she has awakened at 4 AM daily and has been unable to fall back asleep. She also has crying spells every morning. During the past 6 months, she has had a 3.2-kg (7-lb) weight loss. She has no history of serious illness and takes no medications. Her father committed suicide at the age of 52 years. The patient is 170 cm (5 ft 7 in) tall and weighs 69 kg (152 lb); BMI is 24 kg/m^2. Physical examination shows no abnormalities. On mental status examination, she is sad and tearful. Her speech is soft and goal directed. She says that she has not thought about suicide and does not want to die. Laboratory findings, including a complete blood count, serum electrolyte concentrations, and serum thyroid-stimulating hormone concentration, are within the reference range. Which of the following is the most appropriate next step in management?

A) Psychodynamic psychotherapy
B) Citalopram therapy
C) Lithium carbonate therapy
D) Zolpidem therapy
E) Electroconvulsive therapy

Correct Answer: B.

This patient with depressed mood, insomnia, decreased energy, weight loss (likely reflecting a decreased appetite), and apathy (which may reflect anhedonia) likely possesses a diagnosis of major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt social or occupational functioning. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation and consider hospitalization if a patient endorses active suicidal ideation. The most effective initial treatment includes both psychotherapy and antidepressant medication, though monotherapy with either an antidepressant medication or psychotherapy is also appropriate. Selective serotonin reuptake inhibitors (SSRIs, such as citalopram) have the lowest adverse effect burden of antidepressant medications and are therefore first-line MDD medications.

Incorrect Answers: A, C, D, and E.

Psychodynamic psychotherapy (Choice A) is an insight-oriented psychotherapy utilized for a range of anxiety, mood, and personality disorders in which the patient's

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Correct Answer: B.

This patient with depressed mood, insomnia, decreased energy, weight loss (likely reflecting a decreased appetite), and apathy (which may reflect anhedonia) likely possesses a diagnosis of major depressive disorder (MDD). Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation or agitation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt social or occupational functioning. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation and consider hospitalization if a patient endorses active suicidal ideation. The most effective initial treatment includes both psychotherapy and antidepressant medication, though monotherapy with either an antidepressant medication or psychotherapy is also appropriate. Selective serotonin reuptake inhibitors (SSRIs, such as citalopram) have the lowest adverse effect burden of antidepressant medications and are therefore first-line MDD medications.

Incorrect Answers: A, C, D, and E.

Psychodynamic psychotherapy (Choice A) is an insight-oriented psychotherapy utilized for a range of anxiety, mood, and personality disorders in which the patient's unconscious motivations and conflicts are explored. Psychodynamic psychotherapy has less evidence for MDD treatment than pharmacotherapy or other modalities of psychotherapy such as cognitive-behavioral therapy.

Lithium carbonate therapy (Choice C) is a mood stabilizing medication that is commonly utilized in bipolar disorder and sometimes used in refractory MDD, but it causes several serious adverse effects such as kidney and thyroid damage. This patient should try several first or second line MDD medications such as SSRIs or selective serotonin and norepinephrine reuptake inhibitors (SNRIs) before trying lithium.

Zolpidem therapy (Choice D) is a non-benzodiazepine sedative-hypnotic medication that is utilized for insomnia. This patient's new-onset insomnia is likely secondary to MDD and will therefore improve with appropriate MDD treatment.

Electroconvulsive therapy (ECT) (Choice E) involves the induction of a generalized seizure and is indicated in patients with refractory MDD, bipolar disorder, psychotic disorders, and catatonia. This patient should try a few first or second line MDD medications such as SSRIs or SNRIs before trying ECT.

Educational Objective: Major depressive disorder treatment involves antidepressant medication, psychotherapy, or a combination of both modalities. Selective serotonin reuptake inhibitors have the lowest adverse effect burden of antidepressant medications and are therefore first-line MDD medications.

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41. A case-control study is conducted to determine if the relationship between estrogen replacement therapy (ERT) and the risk for breast cancer is affected by estrogen formulation. Cases consist of 705 women with a history of breast cancer; controls consist of 692 randomly selected, age-matched women. All participants range in age from 50 to 74 years. Researchers record the following ERT data from participants: cumulative dosage, type of formulation, and the duration of treatment. Researchers also record patient height and weight, family history of breast cancer, and reproductive history. Results show that the type of estrogen formulation does not affect the risk for breast cancer. Which of the following raises the most concern regarding the validity of this conclusion?

A) Inadequate number of controls
B) Inclusion of premenopausal women
C) Patient recall bias
D) Pharmacologic differences among estrogen products

Correct Answer: C.

When conducting an investigation, there are many potential biases or pitfalls that can impact the results and lead the investigators to erroneously reject the null hypothesis and report a difference between two groups when one does not exist. One such pitfall is recall bias. Recall bias occurs when awareness of a disorder impacts a subject's recall of past events. Recall bias commonly confounds retrospective studies such as a case-control study because participants may not accurately represent or recall prior exposures. For example, patients who have developed breast cancer are more likely to recall use of estrogen replacement therapy because they may perceive it to be related to this breast cancer development compared to healthy controls. Alternatively, patients with the disease may search their memory for any potential exposure that could be related to their disease compared to controls, who may search their memory less thoroughly. Recall bias can be minimized by using medical records rather than patient experience to quantify an exposure. For example, rather than asking patients what formulation of estrogen replacement therapy they used, the prescription records from the hospital could be searched instead.

Incorrect Answers: A, B, and D.

Inadequate number of controls (Choice A), as well as inadequate sample size overall, would reduce the power of a study to detect a statistically significant difference between the cases and controls. The number of cases in a study and number of controls should be at least equal, though some studies will include more controls by a factor of two or three. In this case, the number of cases and controls are nearly equal at almost 700 in each group, so inadequate sample size or number of controls is

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Correct Answer: C.

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Inclusion of premenopausal women (Choice B) does not change the validity of the study. While premenopausal patients may be less likely to have used estrogen replacement therapy, as long as the controls in the study are age-matched to the cases, the comparison will be valid.

Pharmacologic differences among estrogen products (Choice D) of different formulations are likely to be minimal. Formulation refers to the vehicle or modality by which estrogen is given. For example, some patients may have received topical estrogen cream while other received topical estrogen ointment, or oral estrogen capsules instead of oral estrogen tablets. While the vehicles vary, the pharmacologic mechanism of estrogen is not greatly affected, and this would not likely diminish the study's validity.

Educational Objective: Recall bias occurs when awareness of a disorder impacts a subject's recall of past events. Recall bias commonly confounds retrospective studies such as a case-control study because participants may not accurately represent or recall prior exposures, particularly if they have later developed a disease that they perceive to be related to a prior exposure.

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42. Twenty-four hours after admission to the hospital for a head injury sustained in a motor vehicle collision, an unconscious 23-year-old man has increased urine output. His urine output was 40 mL/h to 60 mL/h during the first 10 hours after admission and has been 450 mL/h during the past 3 hours. On admission, CT scan of the head showed multiple fractures of the facial bones and base of the skull with a minor intracranial hemorrhage. He has no history of serious illness. He is receiving 0.9% saline (75 mL/h). His pulse is 96/min, and blood pressure is 103/68 mm Hg. There is no jugular venous distention when supine. The lungs are clear to auscultation. Heart sounds are normal. There is no peripheral edema. Laboratory studies show:

Serum	
Na^+	148 mEq/L
K^+	4.1 mEq/L
Cl^-	102 mEq/L
HCO_3^-	28 mEq/L
Glucose	95 mg/dL
Creatinine	1 mg/dL
Urine osmolality	105 mOsmol/kg H_2O

Which of the following is the most appropriate next step in management?

A) Insertion of a subdural monitor
B) Administration of desmopressin
C) Administration of furosemide
D) Increasing the rate of administration of 0.9% saline to 450 mL/h, then administering furosemide
E) Switching from 0.9% saline to 5% dextrose in water
F) Cerebral decompression

Correct Answer: B.

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E) Switching from 0.9% saline to 5% dextrose in water
F) Cerebral decompression

Correct Answer: B.

Administration of desmopressin is the most appropriate next step in management of this patient with central diabetes insipidus (DI). Central DI may result from head trauma and is characterized by inadequate secretion of antidiuretic hormone (ADH, also known as vasopressin) from the posterior pituitary. ADH typically binds V_2 receptors of the late distal convoluted tubule and the collecting tubule principal cells, which results in the insertion of aquaporin channels in the luminal surface. This results in increased free water absorption and is typically utilized to maintain tight regulation of serum osmolality. Inadequate production of ADH by the posterior pituitary gland may occur in the setting of various pathologies, such as pituitary tumors, trauma, tuberculosis, or intracranial surgery. This results in a decreased concentration of aquaporin channels inserted within the principal cells of the collecting tubule, leading to an inability to absorb adequate amounts of free water, which results in dilute urine and increased serum osmolality. Patients typically present with the production of large volumes of dilute urine and altered mental status. Treatment is with desmopressin, an analog of vasopressin (ADH), which results in recovery of free water through aquaporin insertion in the collecting tubule.

Incorrect Answers: A, C, D, E, and F.

Insertion of a subdural monitor (Choice A) is incorrect. In patients with head trauma in whom there is concern for increased intracranial pressure (ICP), the insertion of an external ventricular drain can help monitor the ICP while allowing for drainage of the cerebral ventricles, but this device is placed in the ventricles, not in the subdural space.

Administration of furosemide (Choice C) is likely to make this patient's diuresis even worse and would be an inappropriate intervention.

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Insertion of a subdural monitor (Choice A) is incorrect. In patients with head trauma in whom there is concern for increased intracranial pressure (ICP), the insertion of an external ventricular drain can help monitor the ICP while allowing for drainage of the cerebral ventricles, but this device is placed in the ventricles, not in the subdural space.

Administration of furosemide (Choice C) is likely to make this patient's diuresis even worse and would be an inappropriate intervention.

Increasing the rate of administration of 0.9% saline to 450 mL/h, then administering furosemide (Choice D) is incorrect. Increasing the rate of saline administration would not treat the underlying cause of such profound diuresis and administering furosemide would further exacerbate this diuresis.

Switching from 0.9% saline to 5% dextrose in water (Choice E) does not address the underlying problem in this patient, which is a paucity of ADH secretion.

Cerebral decompression (Choice F) is not warranted in this patient who does not have any evidence of increased ICP with impending herniation.

Educational Objective: Central diabetes insipidus may result from head trauma and is characterized by inadequate secretion of antidiuretic hormone. Lack of antidiuretic hormone leads to decreased free water reabsorption from collecting tubules, resulting in an abnormally increased serum osmolality.

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43. A 37-year-old man comes to the physician for a follow-up examination. He was diagnosed with HIV infection 3 weeks ago. He is asymptomatic and takes no medications. His temperature is 37.2°C (99°F), pulse is 100/min, and blood pressure is 100/60 mm Hg. Examination shows no abnormalities except for erythematous scaling at the hairline and the nasolabial folds. His CD4+ T-lymphocyte count is 160/mm^3 (Normal≥500), and plasma HIV viral load is 25,000 copies/mL. Which of the following is the most appropriate pharmacotherapy?

A) *Pneumocystis jirovecii* prophylaxis only
B) Three-drug antiretroviral therapy only
C) Three-drug antiretroviral therapy and *P. jirovecii* prophylaxis
D) Two-drug antiretroviral therapy only
E) Two-drug antiretroviral therapy and *P. jirovecii* prophylaxis

Correct Answer: C.

Three-drug antiretroviral therapy and *Pneumocystis jirovecii* prophylaxis is the most appropriate pharmacotherapy for this patient with HIV infection and a CD4+ T-lymphocyte count of less than 200 cells/mm^3. All patients with a newly diagnosed HIV infection should be started on antiretroviral therapy. Almost all regimens in current clinical use consist of at least three different medications from at least two different classes. Most commonly, these include the nucleoside reverse transcriptase inhibitors, the non-nucleoside reverse transcriptase inhibitors, protease inhibitors, and integrase inhibitors, although newer classes of drugs including viral entry inhibitors are under development. The use of multiple drugs from different classes substantially decreases the risk for HIV resistance to any given medication. In addition to antiretroviral therapy, patients with CD4+ counts less than 200 cells/mm^3 should receive prophylaxis against *P. jirovecii* (formerly *P. carinii*), which is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients, including those with poorly controlled HIV. Prophylaxis can be accomplished with trimethoprim-sulfamethoxazole (TMP-SMX), which is considered first-line therapy, or with atovaquone or dapsone.

Incorrect Answers: A, B, D, and E.

P. jirovecii prophylaxis only (Choice A) is inappropriate. All patients with newly diagnosed HIV infection should be placed on combination antiretroviral therapy while awaiting results of HIV resistance testing.

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C) Three-drug antiretroviral therapy and *P. jirovecii* prophylaxis

D) Two-drug antiretroviral therapy only

E) Two-drug antiretroviral therapy and *P. jirovecii* prophylaxis

Correct Answer: C.

Three-drug antiretroviral therapy and *Pneumocystis jirovecii* prophylaxis is the most appropriate pharmacotherapy for this patient with HIV infection and a CD4+ T-lymphocyte count of less than 200 cells/mm^3. All patients with a newly diagnosed HIV infection should be started on antiretroviral therapy. Almost all regimens in current clinical use consist of at least three different medications from at least two different classes. Most commonly, these include the nucleoside reverse transcriptase inhibitors, the non-nucleoside reverse transcriptase inhibitors, protease inhibitors, and integrase inhibitors, although newer classes of drugs including viral entry inhibitors are under development. The use of multiple drugs from different classes substantially decreases the risk for HIV resistance to any given medication. In addition to antiretroviral therapy, patients with CD4+ counts less than 200 cells/mm^3 should receive prophylaxis against *P. jirovecii* (formerly *P. carinii*), which is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients, including those with poorly controlled HIV. Prophylaxis can be accomplished with trimethoprim-sulfamethoxazole (TMP-SMX), which is considered first-line therapy, or with atovaquone or dapsone.

Incorrect Answers: A, B, D, and E.

P. jirovecii prophylaxis only (Choice A) is inappropriate. All patients with newly diagnosed HIV infection should be placed on combination antiretroviral therapy while awaiting results of HIV resistance testing.

Three-drug antiretroviral therapy only (Choice B) is incorrect. While this patient undoubtedly requires three-drug therapy, he also needs *P. jirovecii* prophylaxis given his decreased CD4+ count.

Two-drug antiretroviral therapy (Choice D), even with the addition of prophylaxis against *P. jirovecii* (Choice E), is incorrect. Two-drug antiretroviral therapy should be avoided as it increases the risk for HIV resistance.

Educational Objective: All patients with a newly diagnosed HIV infection should receive three-drug antiretroviral therapy with medications from at least two different classes. Patients with a CD4+ T-lymphocyte count less than 200 cells/mm^3 should also receive prophylaxis against *P. jirovecii* with TMP-SMX, atovaquone, or dapsone.

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44. A 3-day-old newborn is brought to the physician because of jaundice. The mother states that he was born at home. His temperature is 37°C (98.6°F), pulse is 130/min, respirations are 40/min, and palpable systolic blood pressure is 55 mm Hg. Examination shows bilateral eyelid swelling with copious purulent secretions. Administration of which of the following is most likely to have prevented this condition?

A) Erythromycin
B) Gentian violet
C) Hepatitis B immune globulin
D) Hepatitis B vaccine
E) Vitamin K

Correct Answer: A.

Neonatal conjunctivitis is defined as conjunctival inflammation during the first 30 days of life. The three most common causative organisms are *Neisseria gonorrhoeae, Chlamydia trachomatis,* and Herpes simplex virus. Gonococcal conjunctivitis presents within 3 to 5 days after birth and is characterized by purulent discharge. Gonococcal infections are aggressive and can rapidly progress to keratitis, corneal perforation, or endophthalmitis. Chlamydial conjunctivitis presents within 5 to 14 days of birth and is characterized by watery discharge. Herpetic conjunctivitis presents greater than 14 days after birth. All neonates should be given topical antibiotic prophylaxis to prevent gonococcal conjunctivitis. Historically, topical silver nitrate was a common prophylactic agent that was also a frequent cause of chemical conjunctivitis, which presents within the first 3 days after birth. The use of silver nitrate has more recently been supplanted by the use of topical erythromycin, which binds to bacterial ribosomal 50S subunits to prevent protein synthesis.

Incorrect Answers: B, C, D, and E.

Gentian violet (Choice B) is a dye that is also useful for its antiseptic properties. It is often used for the treatment of fungal skin infections. Fungal infections are not a common cause of conjunctivitis.

Hepatitis B immune globulin (Choice C) and Hepatitis B vaccine (Choice D) should be given to neonates born to mothers with a history of hepatitis B infection. While

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B) Gentian violet
C) Hepatitis B immune globulin
D) Hepatitis B vaccine
E) Vitamin K

Correct Answer: A.

Neonatal conjunctivitis is defined as conjunctival inflammation during the first 30 days of life. The three most common causative organisms are *Neisseria gonorrhoeae, Chlamydia trachomatis,* and Herpes simplex virus. Gonococcal conjunctivitis presents within 3 to 5 days after birth and is characterized by purulent discharge. Gonococcal infections are aggressive and can rapidly progress to keratitis, corneal perforation, or endophthalmitis. Chlamydial conjunctivitis presents within 5 to 14 days of birth and is characterized by watery discharge. Herpetic conjunctivitis presents greater than 14 days after birth. All neonates should be given topical antibiotic prophylaxis to prevent gonococcal conjunctivitis. Historically, topical silver nitrate was a common prophylactic agent that was also a frequent cause of chemical conjunctivitis, which presents within the first 3 days after birth. The use of silver nitrate has more recently been supplanted by the use of topical erythromycin, which binds to bacterial ribosomal 50S subunits to prevent protein synthesis.

Incorrect Answers: B, C, D, and E.

Gentian violet (Choice B) is a dye that is also useful for its antiseptic properties. It is often used for the treatment of fungal skin infections. Fungal infections are not a common cause of conjunctivitis.

Hepatitis B immune globulin (Choice C) and Hepatitis B vaccine (Choice D) should be given to neonates born to mothers with a history of hepatitis B infection. While neonatal jaundice often occurs coincidentally during the same period as neonatal conjunctivitis, it is not a cause of conjunctivitis.

Vitamin K (Choice E) should be administered to all newborns to prevent abnormal bleeding. Neonatal vitamin K deficiency does not present with purulent conjunctivitis.

Educational Objective: All neonates should receive topical prophylaxis against bacterial conjunctivitis caused by *N. gonorrhoeae* and *C. trachomatis*. Erythromycin is the most commonly used prophylactic agent and functions by binding to the bacterial 50S ribosomal subunit to prevent bacterial protein synthesis.

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45. A 25-year-old woman comes to the physician because of shortness of breath, marked malaise, weakness, and fatigue for 4 hours. She felt well until 24 hours ago when she developed muscle soreness after an unusually strenuous physical workout; she took ibuprofen for the pain 1 hour before her symptoms began. She has a history of frequent migraines that have been prevented by taking metoprolol (twice daily) over the past month. Her blood pressure is 100/70 mm Hg. Examination shows facial flushing and mild periorbital edema. Multiple wheezes are heard throughout the lung fields. Avoidance of which of the following substances is most likely to prevent recurrence of a similar episode?

A) Acetaminophen
B) Aspirin
C) Meperidine
D) Prednisone
E) Propoxyphene

Correct Answer: B.

Anaphylaxis, a severe type I hypersensitivity reaction, presents following exposure to an allergen. It is caused by widespread IgE-mediated mast cell degranulation and is characterized by histaminergic responses within multiple organ systems leading to flushing, angioedema, bronchospasm, nausea, vomiting, abdominal discomfort, and vasodilation, which can lead to airway obstruction and circulatory collapse. It is generally acute in onset following a specific exposure and generally does not self-resolve. This patient's anaphylaxis was likely caused by ibuprofen, which she took prior to symptom onset. If not managed promptly, death can occur from hypoxia and/or distributive shock. If the inciting state is not appropriately treated, further decompensation can occur, resulting in progressive hypotension and insufficient perfusion with associated end-organ damage. After the administration of epinephrine, fluid resuscitation should be initiated to increase intravascular volume to support adequate organ perfusion. Avoidance of the allergen and any similar allergens (eg, other non-steroidal anti-inflammatory drugs, including aspirin) is necessary to help reduce the risk for recurrent anaphylaxis.

Incorrect Answers: A, C, D, and E.

The cause of this patient's anaphylactic reaction is likely ibuprofen which she took 1 hour prior to the onset of symptoms. Anaphylaxis typically presents acutely soon after

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likely to prevent recurrence of a similar episode?

A) Acetaminophen
B) Aspirin
C) Meperidine
D) Prednisone
E) Propoxyphene

Correct Answer: B.

Anaphylaxis, a severe type I hypersensitivity reaction, presents following exposure to an allergen. It is caused by widespread IgE-mediated mast cell degranulation and is characterized by histaminergic responses within multiple organ systems leading to flushing, angioedema, bronchospasm, nausea, vomiting, abdominal discomfort, and vasodilation, which can lead to airway obstruction and circulatory collapse. It is generally acute in onset following a specific exposure and generally does not self-resolve. This patient's anaphylaxis was likely caused by ibuprofen, which she took prior to symptom onset. If not managed promptly, death can occur from hypoxia and/or distributive shock. If the inciting state is not appropriately treated, further decompensation can occur, resulting in progressive hypotension and insufficient perfusion with associated end-organ damage. After the administration of epinephrine, fluid resuscitation should be initiated to increase intravascular volume to support adequate organ perfusion. Avoidance of the allergen and any similar allergens (eg, other non-steroidal anti-inflammatory drugs, including aspirin) is necessary to help reduce the risk for recurrent anaphylaxis.

Incorrect Answers: A, C, D, and E.

The cause of this patient's anaphylactic reaction is likely ibuprofen which she took 1 hour prior to the onset of symptoms. Anaphylaxis typically presents acutely soon after exposure to an antigen. Aspirin is similar to ibuprofen in that they are both non-steroidal anti-inflammatory drugs. Ibuprofen does not share similar chemical structures with acetaminophen, meperidine (an opioid analgesic), prednisone (a glucocorticoid), or propoxyphene (an opioid analgesic) (Choices A, C, D, and E).

Educational Objective: Anaphylaxis can occur with medications containing similar chemical structures and epitopes, such as ibuprofen and aspirin, which are both non-steroidal anti-inflammatory drugs.

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46. A 6-month-old boy is brought for a follow-up examination because of chronic constipation since the age of 1 week. Current treatment with rectal stimulation, glycerin suppositories, and 4 ounces of prune juice produces one firm string-like stool every 4 days. He was breast-fed until 2 weeks of age and then switched to a cow's milk-based formula. His current diet also includes cereals, fruits, and pureed vegetables. He has no vomiting but does occasionally spit up after meals. Growth and development are appropriate for age. Immunizations are up-to-date. Abdominal examination shows distention with no tenderness. Rectal examination shows no palpable stool in the ampulla. Which of the following is the most appropriate next step in management?

A) Switch to a lactose-free formula
B) Test of the stool for botulism toxin
C) Stool culture
D) Measurement of serum thyroid-stimulating hormone concentration
E) Rectal manometry
F) Upper gastrointestinal series

Correct Answer: E.

Hirschsprung disease, also known as intestinal aganglionosis, is caused by the congenital absence of the distal portion of the myenteric plexus, a part of the enteric nervous system located between the inner and outer layers of the muscularis externa in the bowel wall. During development, this plexus migrates cephalad to caudad and incomplete migration results in absence of the plexus in the distal portion of the gastrointestinal tract. This often leads to an inability to pass meconium within the first few days of life and, eventually, large bowel obstruction. An explosive expulsion of feces on rectal examination is a classic clinical finding. Barium enema can be used to evaluate for Hirschsprung disease in children but can yield false-negative results and cannot exclude the diagnosis. Rectal manometry can help in the diagnosis of Hirschsprung disease as it is a sensitive screening test that can exclude the diagnosis in the event of a normal study. The most sensitive and specific test is a rectal suction biopsy, which in Hirschsprung disease discloses an absence of ganglion cells.

Incorrect Answers: A, B, C, D, and F.

Switching to a lactose-free formula (Choice A) would be appropriate for patients with lactose intolerance or lactase deficiency. Lactase deficiency presents with abdominal

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incomplete migration results in absence of the plexus in the distal portion of the gastrointestinal tract. This often leads to an inability to pass meconium within the first few days of life and, eventually, large bowel obstruction. An explosive expulsion of feces on rectal examination is a classic clinical finding. Barium enema can be used to evaluate for Hirschsprung disease in children but can yield false-negative results and cannot exclude the diagnosis. Rectal manometry can help in the diagnosis of Hirschsprung disease as it is a sensitive screening test that can exclude the diagnosis in the event of a normal study. The most sensitive and specific test is a rectal suction biopsy, which in Hirschsprung disease discloses an absence of ganglion cells.

Incorrect Answers: A, B, C, D, and F.

Switching to a lactose-free formula (Choice A) would be appropriate for patients with lactose intolerance or lactase deficiency. Lactase deficiency presents with abdominal cramping and diarrhea after ingestion of lactose-containing foods, not constipation.

Test of the stool for botulism toxin (Choice B) would be appropriate for the diagnosis of botulism. Botulism is an acute disease of the neuromuscular junction caused by the exposure to the Clostridium botulinum toxin (eg, in raw honey in infants). Over the course of hours to days, patients develop symmetric hypotonia and hyporeflexia that begins with the cranial nerves and descends to the lower extremities.

Stool culture (Choice C) can aid in the diagnosis of bacterial gastroenteritis, which is uncommon in infants (viral is more common) and presents with diarrhea, not constipation.

Measurement of serum thyroid-stimulating hormone concentration (Choice D) would be appropriate for the diagnosis of hypothyroidism, which can present with constipation, but would also present with other signs of hypothyroidism such as feeding difficulties, lethargy, myxedema, macroglossia, large fontanelles, hypotonia, and hypothermia.

Upper gastrointestinal series (Choice F) is an appropriate diagnostic test for midgut volvulus, which in infants can present with abdominal distension, tenderness, lethargy, and bilious vomiting.

Educational Objective: Hirschsprung disease, also known as intestinal aganglionosis, is caused by the congenital absence of the distal portion of the myenteric plexus, often leading to an inability to pass meconium within the first few days of life and, eventually, large bowel obstruction. The diagnosis of Hirschsprung disease can involve barium enema, rectal manometry, and/or rectal suction biopsy.

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47. A 42-year-old woman comes to the physician because of progressive shortness of breath during the past 6 months. She now has to rest three or four times when climbing one flight of stairs. She has smoked one pack of cigarettes daily for 26 years. She has a chronic nonproductive cough and has wheezing controlled with an albuterol inhaler two to three times weekly. During the past year, her BMI has increased from 45 kg/m^2 to 52 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 95/min, respirations are 24/min and shallow, and blood pressure is 140/90 mm Hg. The lungs are clear to auscultation. Cardiac examination shows no abnormalities. The abdomen is distended. There is 1+ edema of the ankles. Arterial blood gas analysis on room air shows:

pH	7.37
Pco_2	48 mm Hg
Po_2	62 mm Hg
O_2 saturation	92%

Her FEV_1 is 75% of predicted, and total lung capacity is 50% of predicted. Which of the following is the most likely diagnosis?

A) Chronic obstructive pulmonary disease
B) Congestive heart failure
C) Interstitial pneumonia
D) Recurrent pulmonary embolism
E) Restrictive lung disease

Correct Answer: E.

The history, physical examination, and diagnostic studies are most consistent with restrictive lung disease as the cause of this patient's symptoms. The most common cause of decreased total lung capacity and residual volume on pulmonary function testing is restrictive lung disease, which includes diagnoses such as interstitial lung disease, obesity hypoventilation syndrome, and neuromuscular disorders (eg, amyotrophic lateral sclerosis). In this patient with a recent increase in BMI, shallow breaths observed on examination, and evidence of chronic hypoventilation on arterial blood gas analysis, obesity hypoventilation syndrome is the most likely diagnosis to explain her worsening symptoms. There are likely multiple additional contributing factors to her chronic respiratory difficulties, including tobacco use and underlying reactive airway disease, and management should address these issues as well.

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B) Congestive heart failure
C) Interstitial pneumonia
D) Recurrent pulmonary embolism
E) Restrictive lung disease

Correct Answer: E.

The history, physical examination, and diagnostic studies are most consistent with restrictive lung disease as the cause of this patient's symptoms. The most common cause of decreased total lung capacity and residual volume on pulmonary function testing is restrictive lung disease, which includes diagnoses such as interstitial lung disease, obesity hypoventilation syndrome, and neuromuscular disorders (eg, amyotrophic lateral sclerosis). In this patient with a recent increase in BMI, shallow breaths observed on examination, and evidence of chronic hypoventilation on arterial blood gas analysis, obesity hypoventilation syndrome is the most likely diagnosis to explain her worsening symptoms. There are likely multiple additional contributing factors to her chronic respiratory difficulties, including tobacco use and underlying reactive airway disease, and management should address these issues as well.

Incorrect Answers: A, B, C, and D.

Chronic obstructive pulmonary disease (Choice A) is most likely a significant comorbidity in this patient with a tobacco use history, chronic cough, and wheezing that improves with inhaled β-adrenergic agonist therapy. However, there is not enough information presented from the patient's pulmonary function testing to make a diagnosis of a concurrent obstructive process. Restrictive lung disease can cause an increased FEV_1/FVC ratio that may mask an underlying obstructive process, and management should focus on reducing the restrictive element initially.

Congestive heart failure (Choice B) typically presents with shortness of breath, orthopnea, paroxysmal nocturnal dyspnea, peripheral edema, jugular venous distention, rales on examination, and an S_3 or S_4 gallop. The patient's examination is not consistent with congestive heart failure.

Interstitial pneumonia (Choice C) is a generic term referring to a variety of types of interstitial lung disease (ILD). ILD, in general, is characterized by progressive pulmonary fibrosis and decline in respiratory function. A restrictive pattern may be seen on spirometry. This patient with a high BMI and evidence of hypoventilation is more likely suffering from restrictive lung disease caused by obesity hypoventilation syndrome. The restrictive pattern in this case is caused by decreased chest wall compliance.

Recurrent pulmonary embolism (Choice D) may result in chronic pulmonary hypertension and hypoxemia but would not explain the patient's reduced total lung capacity.

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E) Restrictive lung disease

Correct Answer: E.

The history, physical examination, and diagnostic studies are most consistent with restrictive lung disease as the cause of this patient's symptoms. The most common cause of decreased total lung capacity and residual volume on pulmonary function testing is restrictive lung disease, which includes diagnoses such as interstitial lung disease, obesity hypoventilation syndrome, and neuromuscular disorders (eg, amyotrophic lateral sclerosis). In this patient with a recent increase in BMI, shallow breaths observed on examination, and evidence of chronic hypoventilation on arterial blood gas analysis, obesity hypoventilation syndrome is the most likely diagnosis to explain her worsening symptoms. There are likely multiple additional contributing factors to her chronic respiratory difficulties, including tobacco use and underlying reactive airway disease, and management should address these issues as well.

Incorrect Answers: A, B, C, and D.

Chronic obstructive pulmonary disease (Choice A) is most likely a significant comorbidity in this patient with a tobacco use history, chronic cough, and wheezing that improves with inhaled β-adrenergic agonist therapy. However, there is not enough information presented from the patient's pulmonary function testing to make a diagnosis of a concurrent obstructive process. Restrictive lung disease can cause an increased FEV_1/FVC ratio that may mask an underlying obstructive process, and management should focus on reducing the restrictive element initially.

Congestive heart failure (Choice B) typically presents with shortness of breath, orthopnea, paroxysmal nocturnal dyspnea, peripheral edema, jugular venous distention, rales on examination, and an S_3 or S_4 gallop. The patient's examination is not consistent with congestive heart failure.

Interstitial pneumonia (Choice C) is a generic term referring to a variety of types of interstitial lung disease (ILD). ILD, in general, is characterized by progressive pulmonary fibrosis and decline in respiratory function. A restrictive pattern may be seen on spirometry. This patient with a high BMI and evidence of hypoventilation is more likely suffering from restrictive lung disease caused by obesity hypoventilation syndrome. The restrictive pattern in this case is caused by decreased chest wall compliance.

Recurrent pulmonary embolism (Choice D) may result in chronic pulmonary hypertension and hypoxemia but would not explain the patient's reduced total lung capacity.

Educational Objective: Decreased total lung capacity and residual volume on pulmonary function testing are suggestive of restrictive lung disease. Restrictive lung disease may result from conditions that cause decreased chest wall compliance, respiratory muscle weakness, or decreased lung parenchyma compliance.

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48. A 32-year-old woman, gravida 3, para 1, aborta 1, is brought to the emergency department at 28 weeks' gestation because of uterine contractions for the past 4 hours. Her first pregnancy ended in a spontaneous abortion at 16 weeks' gestation, and her second pregnancy resulted in a delivery at 28 weeks' gestation; the newborn initially had respiratory distress. This pregnancy has been progressing normally. Her temperature is 37°C (98.6°F), pulse is 86/min, respirations are 16/min, and blood pressure is 120/70 mm Hg. Examination shows a uterus consistent in size with a 28-week gestation. The cervix is partially effaced. Uterine contractions occur every 5 minutes. Which of the following is the most appropriate pharmacotherapy at this time?

A) Desmopressin
B) Ergonovine
C) Magnesium sulfate
D) Mifepristone
E) Misoprostol
F) Oxytocin

Correct Answer: C.

Preterm labor occurs between 20 and 37 weeks' gestation with regular uterine contractions and accompanied cervical change, such as cervical effacement and/or dilation. Risk factors for preterm labor and delivery include a previous preterm labor, prior cervical surgery, extremes of reproductive age, short interpregnancy interval, physical labor, multiple gestations, poly- or oligohydramnios, maternal medical comorbidities (eg, diabetes mellitus), substance use, and genitourinary infections. Initial evaluation of a patient with features concerning for preterm labor, such as premature contractions as in this patient, depend on the gestational age and the amount of cervical dilation. Further evaluation and management are usually reserved for gestations of less than 34 weeks. If the cervix is dilated to 3 cm or more, or the cervical length is shortened with a positive fetal fibronectin test, preterm delivery is likely. Treatment includes tocolytic therapy (eg, nifedipine, terbutaline) to reduce contractions, corticosteroids for gestations of less than 34 weeks to improve fetal lung maturity, magnesium sulfate for gestations of less than 32 weeks for neuroprotection, and antibiotics for *Group B streptococcus* prophylaxis. Magnesium sulfate also acts a less potent tocolytic.

Incorrect Answers: A, B, D, E, and F.

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labor, multiple gestations, poly- or oligohydramnios, maternal medical comorbidities (eg, diabetes mellitus), substance use, and genitourinary infections. Initial evaluation of a patient with features concerning for preterm labor, such as premature contractions as in this patient, depend on the gestational age and the amount of cervical dilation. Further evaluation and management are usually reserved for gestations of less than 34 weeks. If the cervix is dilated to 3 cm or more, or the cervical length is shortened with a positive fetal fibronectin test, preterm delivery is likely. Treatment includes tocolytic therapy (eg, nifedipine, terbutaline) to reduce contractions, corticosteroids for gestations of less than 34 weeks to improve fetal lung maturity, magnesium sulfate for gestations of less than 32 weeks for neuroprotection, and antibiotics for *Group B streptococcus* prophylaxis. Magnesium sulfate also acts a less potent tocolytic.

Incorrect Answers: A, B, D, E, and F.

Desmopressin (Choice A) is most commonly used during pregnancy for the treatment of patients with von Willebrand disease because it increases plasma concentrations of von Willebrand factor and factor VIII. It is not used in the management of preterm labor.

Ergonovine (Choice B) is an ergot alkaloid that causes uterine smooth muscle contraction. It is often used in the management of postpartum hemorrhage caused by uterine atony. Since it causes uterine contraction, it would be contraindicated in preterm labor.

Mifepristone (Choice D) is a progesterone receptor antagonist. It is most commonly used in the elective termination of pregnancy. The inhibition of progesterone leads to uterine contraction that leads to expulsion of the fetus, which would be contraindicated in preterm labor.

Misoprostol (Choice E) is a synthetic prostaglandin that induces uterine smooth muscle contraction and is used in the treatment of postpartum hemorrhage caused by uterine atony. Uterine smooth muscle contraction would likely precipitate preterm delivery, rather than delay it.

Oxytocin (Choice F) is routinely used following delivery to cause uterine contraction to prevent postpartum hemorrhage. It is also used in the induction and augmentation of labor. It would be contraindicated in patients at risk for preterm delivery.

Educational Objective: Preterm labor refers to the onset of uterine contractions and cervical change between 20 and 37 weeks' gestation, although further intervention is often reserved for patients at less than 34 weeks' gestation. Management includes tocolytic therapy (eg, nifedipine, terbutaline) to reduce contractions, corticosteroids for gestations of less than 34 weeks to improve fetal lung maturity, magnesium sulfate for gestations of less than 32 weeks for neuroprotection, and antibiotics for *Group B streptococcus* prophylaxis.

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49. A 21-year-old man comes to student health services because of anxiety and an inability to concentrate that began 6 weeks ago after he learned that his parents are getting a divorce. He says that he is not feeling like himself and that his academic performance has deteriorated. He has not had changes in sleep or appetite. He reports that he still enjoys sports and spending time with his girlfriend. Physical examination shows no abnormalities. On mental status examination, he says that he is hopeful about his future and is looking forward to starting a job in a few months. There is no evidence of suicidal ideation or psychosis. Which of the following is the most likely diagnosis?

A) Acute stress disorder
B) Adjustment disorder
C) Generalized anxiety disorder
D) Major depressive disorder
E) Parent-child relational problem

Correct Answer: B.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily functioning. Adjustment disorders are typically associated with anxiety, depression, or behavioral symptoms without meeting the criteria of anxiety or depressive disorders. As adjustment disorder is typically self-limited, the treatment of adjustment disorder commonly includes brief supportive psychotherapy, though brief pharmacotherapy that targets associated symptoms may be empirically provided.

Incorrect Answers: A, C, D, and E.

Acute stress disorder (Choice A) presents with intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient possesses no recent history of trauma and does not demonstrate intrusive thoughts or avoidance symptoms.

Generalized anxiety disorder (Choice C) is an anxiety disorder that presents with excessive and difficult to control worrying about a range of topics along with hyperactivity,

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D) Major depressive disorder

E) Parent-child relational problem

Correct Answer: B.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily functioning. Adjustment disorders are typically associated with anxiety, depression, or behavioral symptoms without meeting the criteria of anxiety or depressive disorders. As adjustment disorder is typically self-limited, the treatment of adjustment disorder commonly includes brief supportive psychotherapy, though brief pharmacotherapy that targets associated symptoms may be empirically provided.

Incorrect Answers: A, C, D, and E.

Acute stress disorder (Choice A) presents with intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood/thoughts that occur within 1 month of a traumatic event such as physical or sexual violence. This patient possesses no recent history of trauma and does not demonstrate intrusive thoughts or avoidance symptoms.

Generalized anxiety disorder (Choice C) is an anxiety disorder that presents with excessive and difficult to control worrying about a range of topics along with hyperactivity, disordered sleep, fatigue, and trouble relaxing for at least 6 months. This patient's anxiety is specific to his parents' divorce and has only endured 6 weeks.

Major depressive disorder (Choice D) includes 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, psychomotor retardation, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). This patient does not meet the symptom criteria for major depressive disorder.

Parent-child relational problem (Choice E) refers to relationship dissatisfaction between a parent and child. However, this patient does not demonstrate evidence of interpersonal difficulty with either of his parents (his distress is instead related to the dissolution of his parents' relationship).

Educational Objective: Adjustment disorder refers to the onset of disproportionate distress and associated anxiety, depression, or behavioral changes within 3 months of an identifiable stressor. Treatment commonly includes brief psychotherapy.

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50. A 72-year-old man comes to the physician because of a 1-month history of difficulty maintaining an erection. He has been married for 50 years, and he and his wife have not had any previous difficulty with sexual intercourse. He has a history of angina pectoris and underwent coronary angioplasty 6 years ago. He takes sublingual nitroglycerin as needed. He drinks two alcoholic beverages daily. Examination shows no abnormalities. Which of the following is the most appropriate recommendation with respect to this patient's sexual activity?

A) Abstain from alcohol
B) Continue sexual activity with his wife but do not have intercourse
C) Begin sildenafil therapy
D) Take nitroglycerin prior to sexual activity
E) No measures are indicated because he has normal age-related changes to sexual function

Correct Answer: A.

An easily reversible cause of erectile dysfunction is substance use. Before vascular causes are considered, this patient should first determine whether his erectile dysfunction improves with abstinence from alcohol use. Alcohol decreases gonadotropin release from the hypothalamus and testosterone release from the testes, resulting in decreased libido. Chronic alcohol use also decreases the production of nitric oxide, decreasing the relaxation of the corpora cavernosa vasculature, and consequently decreasing erectile function. These mechanisms of erectile dysfunction typically present with continued nocturnal erections because nitric oxide concentrations are commonly sufficient to allow for nocturnal erections and erections from direct penile stimulation but insufficient to permit the level of rigidity required for penetration of a sexual partner. Alcohol-induced erectile dysfunction is reversible with abstinence from alcohol.

Incorrect Answers: B, C, D, and E.

Continuing sexual activity with his wife but avoiding intercourse (Choice B) would be unnecessary because this patient's erectile dysfunction is likely reversible.

Beginning sildenafil therapy (Choice C) may be indicated in some patients once substance-induced erectile dysfunction is excluded. However, this patient is taking nitroglycerin, which may cause life-threatening hypotension when combined with sildenafil.

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B) Continue sexual activity with his wife but do not have intercourse

C) Begin sildenafil therapy

D) Take nitroglycerin prior to sexual activity

E) No measures are indicated because he has normal age-related changes to sexual function

Correct Answer: A.

An easily reversible cause of erectile dysfunction is substance use. Before vascular causes are considered, this patient should first determine whether his erectile dysfunction improves with abstinence from alcohol use. Alcohol decreases gonadotropin release from the hypothalamus and testosterone release from the testes, resulting in decreased libido. Chronic alcohol use also decreases the production of nitric oxide, decreasing the relaxation of the corpora cavernosa vasculature, and consequently decreasing erectile function. These mechanisms of erectile dysfunction typically present with continued nocturnal erections because nitric oxide concentrations are commonly sufficient to allow for nocturnal erections and erections from direct penile stimulation but insufficient to permit the level of rigidity required for penetration of a sexual partner. Alcohol-induced erectile dysfunction is reversible with abstinence from alcohol.

Incorrect Answers: B, C, D, and E.

Continuing sexual activity with his wife but avoiding intercourse (Choice B) would be unnecessary because this patient's erectile dysfunction is likely reversible.

Beginning sildenafil therapy (Choice C) may be indicated in some patients once substance-induced erectile dysfunction is excluded. However, this patient is taking nitroglycerin, which may cause life-threatening hypotension when combined with sildenafil.

Taking nitroglycerin prior to sexual activity (Choice D) is not indicated. Topical nitroglycerin is being investigated as an erectile dysfunction treatment. However, substance-induced erectile dysfunction should first be excluded.

Normal age-related changes (Choice E) may include a delayed erection and decreased intensity of orgasm. However, an acute inability to sustain an erection is abnormal.

Educational Objective: Alcohol use can lead to erectile dysfunction. Patients who drink regularly should be counseled to abstain from alcohol to promote improvement of erectile dysfunction.

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1. A 22-year-old man has a temperature of 39.5°C (103.1°F) 1 hour after initiation of a transfusion of packed red blood cells for a hemoglobin concentration of 7 g/dL. Yesterday, he underwent open reduction and internal fixation of a fractured femur sustained in a motor vehicle collision. He received prophylactic cefazolin prior to the operation and is now receiving enoxaparin. He is otherwise healthy and has no known allergies. The remainder of the vital signs are within normal limits. Examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Sputum and urine cultures
B) Venous duplex ultrasonography of the lower extremities
C) Ventilation-perfusion lung scans
D) Anticoagulant therapy
E) Empiric antibiotic therapy
F) Discontinuation of the blood transfusion

Correct Answer: F.

Discontinuation of the blood transfusion is the most appropriate next step in management of this patient with new onset fever 1 hour after starting a transfusion of packed red blood cells. His presentation is most consistent with a transfusion reaction. Transfusion reactions are common and can range in severity from mild discomfort (eg, itching, fever, mild rash) to life-threatening illness (eg, hemolysis, anaphylaxis). Most febrile transfusion reactions are nonhemolytic and are the usually the result of preformed antibodies to donor leukocyte antigens, all patients should be assessed for the presence of hemolysis, which indicates a far more severe and potentially life-threatening reaction. Typical laboratory tests that should be obtained include a complete blood count, lactate dehydrogenase, haptoglobin, and urinalysis with microscopy. If there is no evidence of hemolysis, transfusion can typically be resumed after giving antipyretics. If fever persists after cessation of the transfusion, then other causes of fever such as developing sepsis, should be considered.

Incorrect Answers: A, B, C, D, and E.

Sputum and urine cultures (Choice A) are not necessary at this time as the patient does not have a productive cough indicative of pneumonia or any urinary symptoms. If fever persists despite stopping the transfusion, then a thorough evaluation for possible infection would be appropriate.

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itching, fever, mild rash) to life-threatening illness (eg, hemolysis, anaphylaxis). Most febrile transfusion reactions are nonhemolytic and are the usually the result of preformed antibodies to donor leukocyte antigens, all patients should be assessed for the presence of hemolysis, which indicates a far more severe and potentially life-threatening reaction. Typical laboratory tests that should be obtained include a complete blood count, lactate dehydrogenase, haptoglobin, and urinalysis with microscopy. If there is no evidence of hemolysis, transfusion can typically be resumed after giving antipyretics. If fever persists after cessation of the transfusion, then other causes of fever such as developing sepsis, should be considered.

Incorrect Answers: A, B, C, D, and E.

Sputum and urine cultures (Choice A) are not necessary at this time as the patient does not have a productive cough indicative of pneumonia or any urinary symptoms. If fever persists despite stopping the transfusion, then a thorough evaluation for possible infection would be appropriate.

Venous duplex ultrasonography of the lower extremities (Choice B) is reasonable if there is suspicion for a deep venous thrombosis. This patient has been on prophylactic anticoagulation with enoxaparin, which makes this diagnosis less likely.

Ventilation-perfusion (VQ scan) lung scans (Choice C) are used to assess for the presence of a pulmonary embolism. In most instances, CT scan with contrast timed to opacify the pulmonary arterial tree is superior to a VQ scan and should be performed when patients develop signs or symptoms consistent with pulmonary embolism, such as tachycardia or hypoxia.

Anticoagulant therapy (Choice D) at a full dose would be indicated if the patient were diagnosed with venous thrombosis or with pulmonary embolism, but neither of these conditions has been diagnosed, so the patient should continue on a prophylactic dose of enoxaparin.

Empiric antibiotic therapy (Choice E) is a consideration if the patient has persistent fever despite stopping the blood transfusion and also develops early signs of sepsis, but it is not the best intervention at this time.

Educational Objective: Acute febrile nonhemolytic transfusion reactions are a common type of transfusion reaction and typically resolve with supportive care, but all patients who develop fever during a transfusion should at least be assessed for the presence of hemolysis. If there is no evidence of hemolysis, the transfusion can usually be restarted safely. Transfusion of leukodepleted or leukoreduced red blood cells decreases the risk for developing a recurrent acute febrile nonhemolytic transfusion reaction.

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2. A 62-year-old Asian man comes to the physician because of a 10-month history of a dark lesion on the nail of his right big toe. One year ago, he dropped something on the toe, but he is unsure if this accident caused the lesion. Initially, the lesion was a 0.5-cm, longitudinal, black streak near the side of the toenail. During the past 2 months, the lesion has enlarged and has spread to the nail fold. He has no history of serious illness and takes no medications. A photograph of the right big toe is shown. Examination shows no other abnormalities. Which of the following is the most likely diagnosis?

A) Acral lentiginous melanoma

B) Benign junctional melanocytic nevus

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2. A 62-year-old Asian man comes to the physician because of a 10-month history of a dark lesion on the nail of his right big toe. One year ago, he dropped something on the toe, but he is unsure if this accident caused the lesion. Initially, the lesion was a 0.5-cm, longitudinal, black streak near the side of the toenail. During the past 2 months, the lesion has enlarged and has spread to the nail fold. He has no history of serious illness and takes no medications. A photograph of the right big toe is shown. Examination shows no other abnormalities. Which of the following is the most likely diagnosis?

A) Acral lentiginous melanoma
B) Benign junctional melanocytic nevus
C) Cholesterol embolism
D) Postinflammatory hyperpigmentation
E) Subungual hematoma

Correct Answer: A.

Acral lentiginous melanoma is a subtype of malignant melanoma that occurs on the fingers and toes, often in individuals of Asian or African descent, unrelated to sun exposure. Melanoma is a neoplasm of melanocytes, which contain pigment in melanosomes. Malignant melanoma has the ability to rapidly invade and metastasize, which carries a poor prognosis when diagnosed late. Subtypes include superficial spreading, nodular, lentigo maligna, and acral lentiginous. Like other forms of malignant melanoma, acral lentiginous melanoma is marked by a pigmented lesion that demonstrates asymmetry, irregular appearing borders, variable coloration, a diameter greater than 6 mm, and rapid evolution in characteristics. Acral lentiginous melanoma which involves the nail may begin as a longitudinal brown streak on the nail. However, this finding, termed longitudinal melanonychia, can also be normal in certain ethnic groups. If longitudinal melanonychia is increasing in thickness or pigment has extended onto the nail fold (Hutchinson sign), then melanoma is increasingly likely. Because acral lentiginous melanoma often goes undetected by patients or physicians, it frequently has a greater depth of invasion at the time of diagnosis, and subsequently, it has a worse prognosis than other melanoma subtypes which occur in more visible locations. Any lesion with features suggestive of malignant melanoma should be surgically excised with negative margins and pathologically examined for the depth of dermal invasion.

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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Benign junctional melanocytic nevus (Choice B) does not have asymmetry, color variation, a diameter greater than 6 mm, or rapid evolution. Benign melanocytic nevi can occur in the nail matrix causing longitudinal melanonychia, but they do not continue increasing in size or demonstrate the variegated color of this patient's lesion.

Cholesterol embolism (Choice C) can cause ischemia of the digits which presents as purple to black patches on the toes. This patient's lesion is brown pigmented which indicates a process of melanocytes rather than tissue ischemia.

Postinflammatory hyperpigmentation (Choice D) is a light to medium brown discoloration of the skin which occurs after an inflammatory process. It would be unusual to occur after a trauma to the toe and would not explain the variegated color, asymmetry, or increasing growth of this lesion.

Subungual hematoma (Choice E) occurs after a trauma to the toe and can be mistaken for melanoma and vice versa. Findings suggestive of a diagnosis of subungual hematoma over melanoma include a clear history of the lesion being induced by trauma and the darkly-colored area growing out farther from the proximal nail fold with time as the nail plate grows. The color of subungual hematoma is less helpful as it can appear dark purple or black which are also seen in melanoma.

Educational Objective: Acral lentiginous melanoma is a subtype of malignant melanoma that occurs on the fingers and toes, often in individuals of Asian or African descent, unrelated to sun exposure. Like other forms of malignant melanoma, acral lentiginous melanoma is marked by a pigmented lesion that demonstrates asymmetry;

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carries a poor prognosis when diagnosed late. Subtypes include superficial spreading, nodular, lentigo maligna, and acral lentiginous. Like other forms of malignant melanoma, acral lentiginous melanoma is marked by a pigmented lesion that demonstrates asymmetry, irregular appearing borders, variable coloration, a diameter greater than 6 mm, and rapid evolution in characteristics. Acral lentiginous melanoma which involves the nail may begin as a longitudinal brown streak on the nail. However, this finding, termed longitudinal melanonychia, can also be normal in certain ethnic groups. If longitudinal melanonychia is increasing in thickness or pigment has extended onto the nail fold (Hutchinson sign), then melanoma is increasingly likely. Because acral lentiginous melanoma often goes undetected by patients or physicians, it frequently has a greater depth of invasion at the time of diagnosis, and subsequently, it has a worse prognosis than other melanoma subtypes which occur in more visible locations. Any lesion with features suggestive of malignant melanoma should be surgically excised with negative margins and pathologically examined for the depth of dermal invasion.

Incorrect Answers: B, C, D, and E.

Benign junctional melanocytic nevus (Choice B) does not have asymmetry, color variation, a diameter greater than 6 mm, or rapid evolution. Benign melanocytic nevi can occur in the nail matrix causing longitudinal melanonychia, but they do not continue increasing in size or demonstrate the variegated color of this patient's lesion.

Cholesterol embolism (Choice C) can cause ischemia of the digits which presents as purple to black patches on the toes. This patient's lesion is brown pigmented which indicates a process of melanocytes rather than tissue ischemia.

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Educational Objective: Acral lentiginous melanoma is a subtype of malignant melanoma that occurs on the fingers and toes, often in individuals of Asian or African descent, unrelated to sun exposure. Like other forms of malignant melanoma, acral lentiginous melanoma is marked by a pigmented lesion that demonstrates asymmetry, irregular appearing borders, variable coloration, a diameter greater than 6 mm, and rapid evolution in characteristics. Surgical excision and imaging to evaluate for metastases are necessary in the management of acral lentiginous melanoma.

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3. An 18-year-old primigravid woman at 39 weeks' gestation is admitted to the hospital in labor. Contractions occur every 5 minutes and last 1 minute. Her first prenatal visit was 1 week ago. She was treated for syphilis 1 year ago. Her only current medication is a prenatal vitamin, which she started 1 week ago. She uses cocaine and heroin. She has had sexual intercourse with multiple male partners. They use condoms inconsistently. The patient appears well. Vital signs are within normal limits. On pelvic examination, the cervix is 4 cm dilated and 50% effaced. The uterus is consistent in size with a 39-week gestation. No abnormalities are noted. Laboratory studies show:

HBsAg	positive
Anti-HBs	negative
Rapid plasma reagin	negative
Fluorescent treponemal antibody assay	positive
Herpes simplex virus antibody assay	positive IgG at 1:640
HIV ELISA	positive

Vaginal testing for group B streptococcus and cervical testing for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* are negative. Intrapartum pharmacotherapy should be administered to prevent which of the following in the newborn?

A) Cocaine withdrawal
B) Hepatitis B transmission
C) Herpes simplex virus transmission
D) HIV transmission
E) Syphilis transmission

Correct Answer: D.

The risk for intrapartum vertical transmission of HIV may be reduced by routine maternal HIV testing during pregnancy and by careful planning of delivery. Treatment during pregnancy with combination antiretroviral therapy reduces the risk for vertical transmission. The risk for vertical transmission of HIV in women with viral loads less than 1,000 copies/mL is low in both vaginal and cesarean methods of delivery. Women with an increased viral load, those who have not been treated previously, or those

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A) Cocaine withdrawal
B) Hepatitis B transmission
C) Herpes simplex virus transmission
D) HIV transmission
E) Syphilis transmission

Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

Cocaine withdrawal (Choice A) in a newborn can present with trembling, excessive crying, sleep difficulties, poor feeding and sucking, or vomiting. Intrapartum cocaine use can also result in placental insufficiency, spontaneous abortion, and/or fetal demise. Intrapartum pharmacotherapy is not typically used to prevent withdrawal.

Hepatitis B (HBV) transmission (Choice B) may occur during pregnancy in women with active hepatitis B infection, especially in those with a positive hepatitis B envelope antigen test and those with an increased HBV viral DNA concentration. Antiviral treatment is typically begun in the third trimester. While intrapartum pharmacotherapy is not usually needed, infants should be given postexposure prophylaxis with HBV immune globulin and HBV vaccine within 12 hours of delivery.

Herpes simplex virus transmission (Choice C) may be prevented with suppressive doses of acyclovir beginning at 36 weeks' gestation. Intrapartum pharmacotherapy is not usually necessary.

Syphilis transmission (Choice E) may occur in utero, but if a patient presents in labor with a positive treponemal test, there is no indication for intrapartum penicillin. The mother and neonate should be evaluated and treated for syphilis if an active syphilis infection is confirmed.

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E) Syphilis transmission

Correct Answer: D.

The risk for intrapartum vertical transmission of HIV may be reduced by routine maternal HIV testing during pregnancy and by careful planning of delivery. Treatment during pregnancy with combination antiretroviral therapy reduces the risk for vertical transmission. The risk for vertical transmission of HIV in women with viral loads less than 1,000 copies/mL is low in both vaginal and cesarean methods of delivery. Women with an increased viral load, those who have not been treated previously, or those suspected of non-compliance should also be given intrapartum zidovudine immediately prior to or during delivery. Neonates should receive postexposure prophylaxis with antiviral medications and should be exclusively bottle-fed.

Incorrect Answers: A, B, C, and E.

Cocaine withdrawal (Choice A) in a newborn can present with trembling, excessive crying, sleep difficulties, poor feeding and sucking, or vomiting. Intrapartum cocaine use can also result in placental insufficiency, spontaneous abortion, and/or fetal demise. Intrapartum pharmacotherapy is not typically used to prevent withdrawal.

Hepatitis B (HBV) transmission (Choice B) may occur during pregnancy in women with active hepatitis B infection, especially in those with a positive hepatitis B envelope antigen test and those with an increased HBV viral DNA concentration. Antiviral treatment is typically begun in the third trimester. While intrapartum pharmacotherapy is not usually needed, infants should be given postexposure prophylaxis with HBV immune globulin and HBV vaccine within 12 hours of delivery.

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Syphilis transmission (Choice E) may occur in utero, but if a patient presents in labor with a positive treponemal test, there is no indication for intrapartum penicillin. The mother and neonate should be evaluated and treated for syphilis if an active syphilis infection is confirmed.

Educational Objective: Intrapartum treatment with combination antiretroviral therapy reduces the risk for vertical transmission of HIV in HIV-positive mothers. The risk for vertical transmission of HIV in women with viral loads less than 1,000 copies/mL is low in both vaginal and cesarean methods of delivery. Women with an increased viral load, those who have not been treated previously, or those suspected of non-compliance should also be given intrapartum zidovudine immediately prior to or during delivery.

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4. A 92-year-old man is admitted to the hospital because of a 24-hour history of severe abdominal pain and distention, nausea, and vomiting. One week ago, he was discharged from the hospital after repair of a left hip fracture. His postoperative course had been uncomplicated. He has hypertension and cataracts. Medications are hydrochlorothiazide, hydrocodone with acetaminophen, aspirin, and multivitamins. His temperature is 37.7°C (99.9°F), pulse is 100/min, respirations are 14/min, and blood pressure is 146/80 mm Hg. The abdomen is distended and diffusely tender. Bowel sounds are decreased. Rectal examination shows mucus, scant stool, and no masses. Test of the stool for occult blood is negative. An x-ray of the abdomen shows no free air under the diaphragm; there is marked colonic dilation from the cecum to the anus with stool and air-fluid levels. Which of the following is the most likely diagnosis?

A) Carcinoid syndrome
B) Colon cancer
C) Colonic pseudo-obstruction
D) Fecal impaction
E) Irritable bowel syndrome
F) Ischemic colitis

Correct Answer: C.

Colonic pseudo-obstruction, also known as Ogilvie syndrome, presents with signs and symptoms of colonic obstruction in the absence of a mechanical cause of obstruction. Pseudo-obstruction is idiopathic but is thought to result from abnormal function of the gastrointestinal autonomic nervous system. Risk factors include recent surgery, use of opiates, trauma, or systemic illness. Physical examination discloses abdominal distension and diffuse tenderness. The abdomen is usually tympanitic to percussion. Bowel sounds are often decreased but are usually present. Patients with colonic pseudo-obstruction are at an increased risk for colonic perforation or ischemia caused by stretching of the colonic wall. Perforation or ischemia may lead to severe pain, peritoneal signs, and evidence of shock. The presence of mechanical obstruction must be excluded with the use of imaging, such as with an abdominal CT scan or barium contrast enema. Treatment includes the pro-cholinergic agent neostigmine and colonic decompression. Patients with colonic perforation require emergent exploratory laparotomy.

Incorrect Answers: A, B, D, E, and F.

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Incorrect Answers: A, B, D, E, and F.

Carcinoid syndrome (Choice A) is caused by neuroendocrine tumors that produce serotonin, often within the gastrointestinal tract, and presents with diarrhea, cutaneous flushing, and wheezing once serotonin escapes first pass hepatic metabolism in the setting of liver metastasis.

Colon cancer (Choice B) may lead to intestinal obstruction, but more commonly presents with a history of hematochezia, melena, change in bowel habits, or unexplained iron deficiency anemia, rather than colonic dilatation or perforation.

Fecal impaction (Choice D) may lead to colonic obstruction, especially in elderly patients. Hard stool is typically palpable within the rectal vault.

Irritable bowel syndrome (Choice E) presents with intermittent abdominal pain that is relieved by bowel movements and associated alterations in bowel habits with intermittent episodes of diarrhea and/or constipation.

Ischemic colitis (Choice F) is caused by embolic or thrombotic arterial occlusion or a severe hypoperfusion state of the mesenteric vasculature, classically the superior mesenteric artery. Typical symptoms include crampy abdominal pain, tenderness over the affected bowel, and hematochezia. Marked colonic dilatation is not typical of ischemic colitis and suggests colonic obstruction or pseudo-obstruction.

Educational Objective: Colonic pseudo-obstruction presents with signs and symptoms of colonic obstruction in the absence of a mechanical cause of obstruction. Treatment includes the pro-cholinergic agent neostigmine and colonic decompression.

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5. A study is conducted to compare the efficacy of cholesterol-lowering medications X and Y. A total of 500 patients with a serum cholesterol concentration greater than 200 mg/dL are enrolled in the study. Three hundred patients are randomly assigned to receive medication X, and 200 patients are randomly assigned to receive medication Y. Serum cholesterol concentrations are measured for both groups after 6 months of therapy. Which of the following statistical tests will be most helpful in comparing mean serum cholesterol concentrations of both groups?

A) Analysis of variance
B) Chi-square test
C) Correlation coefficient
D) Mann-Whitney test
E) Regression analysis
F) Student unpaired *t*-test

Correct Answer: F.

Statistical tests can be employed to assess whether a difference in values exists. Often, these values are means, though they need not be. Many tests have been derived to assess differences in numerical, quantitative, categorical, and qualitative datasets. Choosing the appropriate test is important in order to appropriately draw conclusions from data. In this case, comparing mean serum cholesterol concentrations after the administration of different drugs to two groups is a comparison of numeric means, which is best assessed by Student's *t*-test, also simply referred to as a *t*-test. The *t*-test determines whether a difference between two means could be reasonably attributed to chance, and if the likelihood of such a conclusion is reasonably low, statistical significance can be inferred.

Incorrect Answers: A, B, C, D, and E.

Analysis of variance (Choice A) is a statistical test that compares means between three or more groups. In this case, only two groups are analyzed, making an unpaired *t*-test more appropriate.

Chi-square tests (Choice B) assess for statistically significant differences between two or more categorical values (eg, proportions, percentages). It is commonly used for

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D) Mann-Whitney test

E) Regression analysis

F) Student unpaired *t*-test

Correct Answer: F.

Statistical tests can be employed to assess whether a difference in values exists. Often, these values are means, though they need not be. Many tests have been derived to assess differences in numerical, quantitative, categorical, and qualitative datasets. Choosing the appropriate test is important in order to appropriately draw conclusions from data. In this case, comparing mean serum cholesterol concentrations after the administration of different drugs to two groups is a comparison of numeric means, which is best assessed by Student's *t*-test, also simply referred to as a *t*-test. The *t*-test determines whether a difference between two means could be reasonably attributed to chance, and if the likelihood of such a conclusion is reasonably low, statistical significance can be inferred.

Incorrect Answers: A, B, C, D, and E.

Analysis of variance (Choice A) is a statistical test that compares means between three or more groups. In this case, only two groups are analyzed, making an unpaired *t*-test more appropriate.

Chi-square tests (Choice B) assess for statistically significant differences between two or more categorical values (eg, proportions, percentages). It is commonly used for larger samples and is also able to compare multiple values (eg, three different experimental groups). It is not used for arithmetic means, as in this scenario.

Correlation coefficients (Choice C) relate the trend of two variables to each other. The most commonly used correlation coefficient is the Pearson correlation coefficient (*r*). Correlation represents the increase, decrease, or absence of change in one variable with changes in the other. In cases where variables trend together (both increase), the *r* value is positive. The closer the value of the correlation coefficient is to 1.0, the stronger the trend is between the two variables. Negative *r* values suggest that data trend in opposing fashion; as one variable increases, the other decreases. Uncorrelated data will have a correlation coefficient near zero, which indicates that changes in one variable are not associated with any particular trend in the other variable. Correlation should not be confused with causation.

The Mann-Whitney test (Choice D), also known as a *U*-test or the Mann-Whitney Wilcoxon test, is a nonparametric test that may be used to compare two groups whose values are not normally distributed, in contrast to the *t*-test, which assumes a normal distribution. It is not useful for comparison of means. Given that both groups of patients were randomly selected from the same population in this scenario, it may be assumed that serum cholesterol distribution will be normally distributed, making the *t* test a more appropriate choice

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Incorrect Answers: A, B, C, D, and E.

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Regression analysis (Choice E) may be performed in two different ways to model the relationship between dependent and independent variables: using linear regression or using nonparametric regression (which does not use a predetermined form, but rather, derives the trend from the data). Regression analysis is not used to compare means. It is more frequently used to predict the dependent variable of an independent variable that is assumed to behave in a similar way to the data used to construct the regression.

Educational Objective: Student's *t*-test assesses for statistically significant differences between the means of two groups. The *t*-test determines whether a difference between two means could be reasonably attributed to chance, and if the likelihood of such a conclusion is reasonably low, statistical significance can be inferred.

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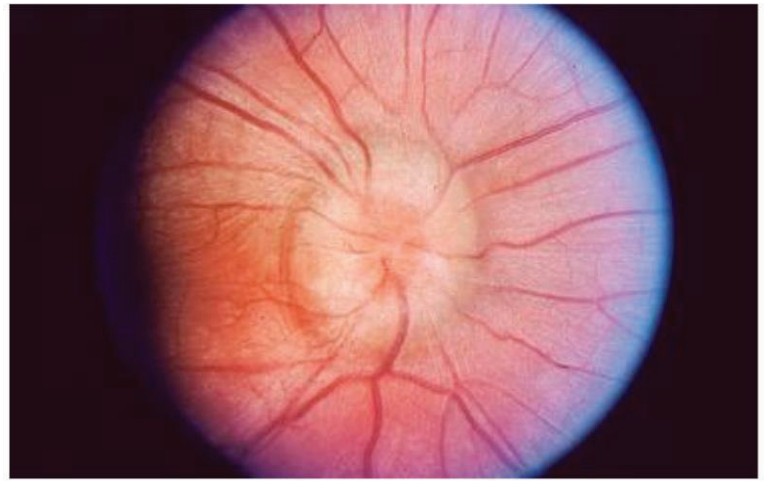
6. A 27-year-old woman comes to the physician because of a 2-week history of recurring bifrontal headaches and vomiting. The headaches are not relieved by over-the-counter analgesics. She has not had visual changes or other neurologic symptoms. She has no history of serious illness and takes no medications. She is alert and fully oriented. She is 157 cm (5 ft 2 in) tall and weighs 104 kg (230 lb); BMI is 42 kg/m^2. Her pulse is 78/min, and blood pressure is 114/72 mm Hg. Funduscopic examination findings are shown. Visual acuity is 20/20 bilaterally. Neurologic examination shows no focal findings. A CT scan of the head shows no abnormalities. Which of the following is the most appropriate next step in management?



A) MRI of the brain
B) Oral carbonic anhydrase inhibitor therapy
C) Intravenous corticosteroid therapy
D) Lumbar puncture
E) Cerebral angiography

Correct Answer: D.

Idiopathic intracranial hypertension (IIH), also known as pseudotumor cerebri, is a disorder of increased intracranial pressure (ICP) that typically occurs in young, overweight women of childbearing age. It presents with symptoms of headache, transient visual obscurations, diplopia caused by cranial nerve VI palsy, tinnitus (which may be pulsatile), nausea, or vomiting. The classic fundoscopic finding of IIH is papilledema, which refers specifically to swelling of the optic nerve head caused by increased ICP. The Frisén scale is used to grade papilledema. This patient presents with grade 4 papilledema, manifesting as elevation of the entire disc, obscuration of major bloods vessels, and a peripapillary halo. IIH is a diagnosis of exclusion and patients in whom IIH is suspected should undergo workup with neuroimaging (to exclude the presence of an intracranial mass prior to lumbar puncture) followed by lumbar puncture to establish the presence of increased ICP. IIH can be diagnosed using the modified Dandy criteria, which include signs and symptoms of increased intracranial pressure (described above), absence of focal neurologic deficits (other than cranial nerve VI palsy), increased ICP greater than 25 cm of water, and absence of other causes of increased ICP, such as a mass lesion. Initial treatment includes lifestyle modifications aimed at a modest weight loss of approximately 5–10% of body weight and oral acetazolamide. Acetazolamide is a carbonic anhydrase inhibitor that acts as a diuretic and indirectly decreases CSF production in the choroid plexus. Patients with refractory symptoms may require neurosurgical intervention with a

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Correct Answer: D.

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Incorrect Answers: A, B, C, and E.

MRI of the brain (Choice A) is not necessary in this patient who has already undergone a CT scan. While an MR venogram may be useful to exclude the presence of a dural venous sinus thrombosis as a potential cause of increased ICP, a routine MRI of the brain will not provide further diagnostic assistance.

Oral carbonic anhydrase inhibitor therapy (Choice B) is not yet appropriate prior to establishing the diagnosis of IIH. Initiating treatment prior to obtaining a lumbar puncture will confound the diagnosis.

Intravenous corticosteroid therapy (Choice C) plays little role in the current treatment of IIH, although they have been used in the treatment of IIH in the past. Intravenous corticosteroids are useful for the treatment of optic neuritis.

Cerebral angiography (Choice E) is useful to identify the presence of an intracranial aneurysm. Berry aneurysms may lead to an oculomotor nerve palsy with a fixed, dilated pupil, but do not typically cause papilledema.

Educational Objective: Idiopathic intracranial hypertension, also known as pseudotumor cerebri, is a disorder of increased intracranial pressure that typically occurs in

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7. A 22-year-old woman comes to the emergency department because of a 3-hour history of right-sided chest pain. During the past 3 months, she has had temperatures to 38.1°C (100.5°F), marked fatigue, easy bruising, and photosensitivity of the skin, especially over her cheeks. She has had a 7-kg (15-lb) weight loss during this time. She has a 6-month history of aching of her hands and knees. This past winter, she noticed that her fingers became blue on exposure to cold weather and then would become painful and red when she returned indoors. She has no history of serious illness and takes no medications. She has not traveled outside the

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A) Cefuroxime therapy
B) Chest tube thoracostomy
C) Ibuprofen therapy
D) Levofloxacin therapy
E) Pericardiocentesis

Correct Answer: C.

Ibuprofen, a non-steroidal anti-inflammatory drug (NSAID), is the first-line treatment of lupus pleuritis, a complication of systemic lupus erythematosus (SLE). Clinical features of SLE include malar rash, photosensitivity, discoid rash, oral ulcers, arthritis, serositis (eg, pleuritis or pericarditis), neurologic symptoms including seizure or psychosis, hematologic impairment (eg, anemia, leukopenia, or thrombocytopenia). Immunologic characteristics include an increased anti-nuclear antibody (ANA) or the presence of other autoantibodies including anti-dsDNA, anti-Smith, or antiphospholipid antibody. A diagnosis of SLE is made when four of these eleven total criteria are present. In this case, the patient's malar rash, photosensitivity, easy bruising indicating thrombocytopenia, arthritis, and now pleuritis are adequate to diagnosis SLE. Pulmonary involvement of SLE is common with pleuritis being a frequent manifestation. The presence of a friction rub on physical examination, as in this case, makes the clinical diagnosis. Lupus pleuritis is treated first with NSAIDs; if it persists, systemic glucocorticoids may be used. Both treatments exert their effects by decreasing inflammation of the pleura. Treatment is important as chronic pleural inflammation can lead to scarring and impaired lung compliance.

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E) Pericardiocentesis

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Incorrect Answers: A, B, D, and E.

Cefuroxime therapy (Choice A) or levofloxacin therapy (Choice D) are both used in the treatment of bacterial infections, such as pneumonia. This patient's presentation is more consistent with lupus pleuritis given her constellation of symptoms suggesting SLE. While she has been intermittently febrile, this is likely related to the systemic inflammation caused by lupus erythematosus rather than a bacterial infection. She has neither physical examination nor radiographic features of pneumonia.

Chest tube thoracostomy (Choice B) is used to remove air or fluid from the pleural space such as occurs with a pneumothorax or pleural effusion. This patient has findings of neither of these conditions. A tube thoracostomy is not indicated in the treatment of lupus pleuritis unless a concomitant pneumothorax, hemothorax, or other pleural effusion is present.

Pericardiocentesis (Choice E) is not necessary in this case as she does not have physical examination findings to suggest a pericardial effusion or tamponade which requires drainage. While pericarditis is a common finding in SLE and occurs at some point in approximately 50% of SLE patients, it is also typically managed with NSAIDs or systemic glucocorticoids.

Educational Objective: Serositis, inflammation of the pleura or pericardial lining, is one of eleven diagnostic criteria for systemic lupus erythematosus. The treatment of choice for lupus pleuritis are non-steroidal anti-inflammatory drugs, followed by systemic glucocorticoids for refractory disease.

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8. A 52-year-old woman comes to the physician 2 weeks after noticing a painless lump in her right breast. Mammography 6 months ago showed no abnormalities. She has no history of serious illness and takes no medications. A 1.5-cm, firm, irregular, nontender mass is palpated in the lower outer quadrant of the right breast. An ultrasonography-guided core biopsy specimen shows infiltrating ductal carcinoma. The patient is concerned about the accuracy of mammography and wishes to know its failure rate in diagnosing breast cancer. Which of the following is the most appropriate test characteristic to determine this answer?

A) Hazard ratio
B) Positive likelihood ratio
C) Positive predictive value
D) Sensitivity
E) Specificity

Correct Answer: D.

The sensitivity of a test is the measurement that will best convey the failure rate of a test to detect disease when it is present. Sensitivity is the ability of a test to detect a disease if it is present. Sensitivity may be calculated as 1 – false negative rate. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (type 2 error). High sensitivity is therefore useful in ruling out a disease. Along with sensitivity, specificity is also used to measure the quality of a diagnostic test. A test is described as specific if it has a high likelihood that when disease is absent, the test is negative; it therefore has a low likelihood of a false positive (type 1 error). Specificity may be calculated as 1 – false positive rate. High specificity is useful when considering a disease. In this case, assuming that the patient's infiltrating ductal carcinoma was present at the time of her mammography 6 months earlier, the patient had a false negative mammography result: her test result was negative when she actually had disease. Because sensitivity is calculated as 1 – false negative rate, the false negative rate (the value desired by this patient) can be easily determined by subtracting the sensitivity from 100%. For example, if the sensitivity of mammography in detecting infiltrating ductal carcinoma is 90%, then the failure rate is 10%.

Incorrect Answers: A, B, C, and E.

Hazard ratio (Choice A) is used to report outcomes in a survival analysis. It is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of

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Incorrect Answers: A, B, C, and E.

Hazard ratio (Choice A) is used to report outcomes in a survival analysis. It is the ratio of the hazard rate of a group exposed to a risk or intervention to the hazard rate of an unexposed group. Unlike an odds ratio, which is cumulative over an entire study, the hazard ratio conveys the risk for a negative outcome during the time of the study. It is not applicable when evaluating a diagnostic test.

Positive likelihood ratio (Choice B) is the ratio of true positives to false positives. It can also be calculated as the ratio of sensitivity to 1 – specificity. A likelihood ratio of >1 conveys that a positive result is more likely to be a true positive than a false positive. Knowing the positive likelihood ratio will not help the patient understand the failure rate of mammography in detecting breast cancer.

Positive predictive value (Choice C) is a statistical measure that defines the proportion of positive test results that are true positives (positive tests in patients who have the condition). PPV is thus defined as (true positives (TP)) / (TP + false positives (FP)), or the true positive rate; it measures the probability of a patient actually having the disease given a positive test result. It is not useful in the counseling of this patient because she had a negative mammography result. The negative predictive value, or the proportion of negative test results that are true negatives, would be more applicable to her case.

Specificity (Choice E) may be calculated as 1 – false positive rate and indicates the ability of a test to be negative when disease is absent. If the patient had a positive mammography result but did not have breast cancer, then the specificity of the test and false positive rate would be helpful.

Educational Objective: The failure rate, or false negative rate, of a test is most easily determined from the sensitivity, which can be calculated as 1 – false negative rate. A test with a high sensitivity, or a low false negative rate, is well-suited for ruling out disease.

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9. A 63-year-old woman comes to the emergency department because of a 1-week history of progressive shortness of breath on exertion and swelling of her legs. During this time, she has been using two pillows to sleep. Her pulse is 100/min, respirations are 24/min, and blood pressure is 120/80 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 93%. There is jugular venous distention. Bilateral basilar crackles are heard over the lower lungs. On cardiac examination, a grade 3/6 holosystolic murmur is heard best over the apex; an S_3 gallop is heard. There is 3+ pitting edema of the lower extremities. Echocardiography shows an ejection fraction of 30%. In addition to furosemide, which of the following is the most appropriate pharmacotherapy at this time?

A) Hydralazine
B) Lisinopril
C) Metoprolol
D) Nifedipine
E) Spironolactone

Correct Answer: B.

Heart failure with reduced ejection fraction (HFrEF) is a common clinical syndrome encountered in medical practice. Patients typically present with progressive dyspnea, orthopnea, and lower extremity swelling. Physical examination findings include elevated jugular venous pressure, peripheral edema, ascites, hepatojugular reflux, pulmonary crackles (rales), and an S_3 or S_4 gallop. An ejection fraction (EF) less than 50% is considered reduced. There are numerous causes that often coexist, which may include ischemic heart disease, valvulopathy, pericardial disease, chronic pulmonary disease, anemia, medication and toxin adverse effects, tachyarrhythmias, and/or infections. Chronic treatment of HFrEF involves the management of underlying causes and associated conditions such as hypertension, hyperlipidemia, diabetes mellitus, and arrhythmias, as well as appropriate pharmacotherapy. The goals of pharmacotherapy are to improve symptoms, preserve myocardial function, and reduce mortality. Initial guideline-recommended therapy is a combination of a β-adrenergic antagonist, a renin-angiotensin-aldosterone system inhibitor, and a diuretic. Given that this is a new diagnosis for the patient and the underlying cause of the patient's heart failure is not known, initial pharmacotherapy should prioritize volume and blood pressure management. In addition to furosemide, the initiation of lisinopril is most appropriate at this time. Once the patient's volume status has been optimized, a repeat echocardiography may be performed to assess for the potential recovery of EF and inform further management decisions.

Incorrect Answers: A, C, D, and E.

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Incorrect Answers: A, C, D, and E.

Hydralazine (Choice A) is an effective agent for lowering blood pressure. However, it has a long half-life and its efficacy is often unpredictable; this may lead to unintended, precipitous drops in blood pressure. It is utilized as a second-line treatment in HFrEF for patients who cannot tolerate renin-angiotensin-aldosterone system inhibitors.

Metoprolol (Choice C) is a common β-adrenergic antagonist employed in the treatment of HFrEF. Given the patient's significant volume overloaded status, new diagnosis, and unclear underlying cause, it is reasonable to first attempt volume reduction and blood pressure control with a diuretic and lisinopril. If a repeat echocardiography shows persistent HFrEF despite volume control, a β-adrenergic antagonist should be added to the patient's regimen. Similarly, mineralocorticoid receptor antagonists such as spironolactone (Choice E) are recommended if additional blood pressure and volume control is needed, or if significant hypokalemia results from loop diuretic use.

Nifedipine (Choice D) is a short acting dihydropyridine calcium channel blocker (CCB) and a potent vasodilator. It is used in the treatment of high-altitude pulmonary edema and hypertensive emergency. Adverse effects include profound hypotension and reflex tachycardia.

Educational Objective: Heart failure with reduced ejection fraction is a common clinical syndrome encountered in medical practice. Initial guideline-recommended therapy is a combination of a β-adrenergic antagonist, a renin-angiotensin-aldosterone system inhibitor, and a diuretic to control symptoms, preserve myocardial function, and reduce mortality.

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10. A healthy 15-year-old girl is brought to the office because she has never had a menstrual period. She takes no medications and has no known allergies. She is 152 cm (5 ft) tall and weighs 48 kg (105 lb); BMI is 21 kg/m^2. Her blood pressure is 98/55 mm Hg. Breast and pubic hair development is Tanner stage 1. Pelvic examination shows normal-appearing external genitalia and a small uterus. Serum studies show a follicle-stimulating hormone concentration of 56 mIU/mL and luteinizing hormone concentration of 42 mIU/mL. Which of the following is the most appropriate next step in diagnosis?

A) Gonadotropin-releasing hormone stimulation test
B) Karyotype analysis
C) Measurement of serum cortisol concentration
D) Measurement of serum thyroid-stimulating hormone concentration
E) MRI of the pituitary fossa

Correct Answer: B.

Turner syndrome is a cause of primary amenorrhea, which is secondary to ovarian dysgenesis in the setting of a 45,X0 genotype. Other signs of Turner syndrome include a short stature, cystic hygroma or webbed neck, swelling in the hands/feet, coarctation of the aorta, bicuspid aortic valve, horseshoe kidney, and infertility. Additionally, because of decreased estrogen concentration, patients fail to develop secondary sexual characteristics and demonstrate an underdeveloped uterus. Vital signs will be within normal limits, and diagnosis is made through a karyotype analysis. Other laboratory findings that may aid in diagnosis are increased concentrations of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) caused by the lack of negative feedback from estrogen. Turner syndrome management in adolescents commonly involves monitoring for cardiac complications, growth hormone replacement, and estrogen replacement to promote increased stature and development of secondary sexual characteristics.

Incorrect Answers: A, C, D, and E.

Gonadotropin-releasing hormone (GnRH) stimulation test (Choice A) can be used to diagnose central precocious puberty (<8 years in girls and <9 years in boys) or, occasionally, delayed puberty. After giving a GnRH analog to patients, concentrations of LH and FSH are measured. Because Turner syndrome is a form of hypergonadotropic hypogonadism, this test would not be helpful.

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Measurement of serum cortisol concentration (Choice C) would be useful for the evaluation of congenital adrenal hyperplasia, which is a disorder of cortisol synthesis with variable effects on mineralocorticoids and androgens. Symptoms include virilization, ambiguous genitalia, salt-wasting, hirsutism, precocious puberty, and primary or secondary amenorrhea, depending on the subtype. This patient does not have virilization, ambiguous genitalia, or precocious puberty.

Measurement of serum thyroid-stimulating hormone concentration (Choice D) may assist in diagnosing hyperthyroidism as a cause of secondary amenorrhea, or the arrest of menses. However, this patient demonstrates primary amenorrhea, or the absence of menses. This patient does not have other signs of hyperthyroidism, such as hair or skin changes.

MRI of the pituitary fossa (Choice E) would assist in diagnosing a prolactinoma, a common cause of secondary amenorrhea. However, this patient has primary amenorrhea.

Educational Objective: Turner Syndrome (45,X0) is associated with ovarian dysgenesis, which leads to primary amenorrhea. Patients commonly present with absent secondary sexual characteristics and an underdeveloped uterus. LH and FSH concentrations are increased because of the absence of negative feedback from estrogen, and diagnosis is made with a karyotype analysis.

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11. A 22-year-old woman is brought to the office by her parents because of a 9-month history of observing her eyebrows in mirrors for up to an hour at a time. She frequently stares at her eyebrows, sometimes separating the hairs with tweezers and examining the skin underneath. She never plucks them. Her behavior has caused her parents to have to remind her to eat meals and go to class. She has fallen behind in her schoolwork and has stopped calling her friends. She appears disheveled. She is 168 cm (5 ft 6 in) tall and weighs 57 kg (125 lb); BMI is 20 kg/m^2. Physical examination shows no abnormalities. On mental status examination, she is alert and fully oriented. She is cooperative and articulate but makes poor eye contact. She describes her mood as "okay." Her affect is flat. Her thought process is linear except when discussing her eyebrows. During the examination, she sees her reflection in a mirror and stares at her eyebrows. She says she is "reading" the hair follicle and direction patterns; she is worried that they might change, which would have dire consequences for her and her family. She says the "reading" may take much time because she often loses track of her progress and must begin again. Which of the following is the most likely diagnosis?

A) Agoraphobia
B) Anorexia nervosa
C) Body dysmorphic disorder
D) Factitious disorder
E) Schizophrenia
F) Somatic symptom disorder

Correct Answer: E.

According to the DSM-5, patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, avolition, alogia). This patient demonstrates delusional thinking about patterns in her eyebrow follicles and negative symptoms (avolition leading to her withdrawal from socializing and self-care, a flat affect). Many patients also illustrate prodromal periods of strange behavior and social withdrawal. To meet diagnostic criteria, patients must demonstrate functional deficits, and the total duration of symptoms must exceed 6 months. Schizophrenia has been postulated to result from excessive pruning of glutamatergic synapses in the cerebral cortex during critical periods of development. Antipsychotic medication is the cornerstone of treatment.

Incorrect Answers: A, B, C, D, and F.

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Correct Answer: E.

According to the DSM-5, patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, avolition, alogia). This patient demonstrates delusional thinking about patterns in her eyebrow follicles and negative symptoms (avolition leading to her withdrawal from socializing and self-care, a flat affect). Many patients also illustrate prodromal periods of strange behavior and social withdrawal. To meet diagnostic criteria, patients must demonstrate functional deficits, and the total duration of symptoms must exceed 6 months. Schizophrenia has been postulated to result from excessive pruning of glutamatergic synapses in the cerebral cortex during critical periods of development. Antipsychotic medication is the cornerstone of treatment.

Incorrect Answers: A, B, C, D, and F.

Agoraphobia (Choice A) refers to the fear of leaving one's home. This patient's social withdrawal is related to her delusional thinking about her eyebrows rather than a fear of leaving her home.

Anorexia nervosa (Choice B) is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and consequent purging behavior or oral intake restriction. This patient's decreased oral intake is likely related to avolition and delusional thinking rather than body weight concerns.

Body dysmorphic disorder (Choice C) manifests as preoccupation with a perceived flaw in physical appearance leading to repetitive behaviors (eg, checking) or mental acts (eg, comparing appearance to others). This patient is not preoccupied with a flaw in her appearance.

In factitious disorder (Choice D), patients consciously produce symptoms (eg, purposely injure themselves, fake a fever by eating something warm) for primary gain. Diagnosis is supported by inconsistencies in the history or physical examination and a history of extensive clinical evaluations. In somatic symptom disorder (Choice F), the patient is excessively preoccupied with one or more somatic symptoms such that these symptoms disrupt daily life. These symptoms may or may not originate from an underlying disease, though they are typically unconsciously produced or exacerbated by psychological factors such as stress. This patient does not endorse physical symptoms.

Educational Objective: Patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, avolition, alogia).

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12. A 44-year-old woman comes to the office with her husband because of a 2-week history of an increasingly severe tremor in her right hand. She is right-handed. The tremor makes it difficult for her to brush her teeth or hold a coffee cup. She also has had a slowed gait during this time. She says she is afraid that she has Parkinson disease like her father. She has no history of serious illness and takes no medications. She works as an executive at an advertising firm. Her husband says, "My wife is coping as best she can, especially considering how stressful her work is." Neurologic examination of the patient shows a resting tremor of the right hand. The tremor increases in severity on finger-nose testing. The tremor decreases when she manipulates a coin in her left hand. Her gait is slow, but balance is intact. The remainder of the examination shows no abnormalities. An MRI of the brain shows no abnormalities. Which of the following is the most likely diagnosis?

A) Body dysmorphic disorder
B) Conversion disorder
C) Delusional disorder
D) Illness anxiety disorder (hypochondriasis)
E) Malingering

Correct Answer: B.

Conversion disorder, also known as functional neurologic disorder, involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. A resting tremor that worsens with action and slow gait without other slow movements or postural instability are inconsistent with Parkinson disease or other known diseases. Functional neurologic disorder is postulated to represent the subconscious conversion of intolerable emotional distress (eg, work stress) into physical symptoms. Psychiatric comorbidities such as depression are common but not present in all patients. Physicians should conduct a thorough history and physical examination and obtain laboratory and imaging studies to evaluate for medical or neurologic diseases that may explain or partially explain the patient's symptoms when the diagnosis is unclear. Treatment of functional neurologic disorder involves education about the diagnosis, physical therapy, and cognitive-behavioral therapy.

Incorrect Answers: A, C, D, and E.

Body dysmorphic disorder (Choice A) manifests as preoccupation with a perceived flaw in physical appearance leading to repetitive behaviors (eg, checking) or mental

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Correct Answer: B.

Conversion disorder, also known as functional neurologic disorder, involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. A resting tremor that worsens with action and slow gait without other slow movements or postural instability are inconsistent with Parkinson disease or other known diseases. Functional neurologic disorder is postulated to represent the subconscious conversion of intolerable emotional distress (eg, work stress) into physical symptoms. Psychiatric comorbidities such as depression are common but not present in all patients. Physicians should conduct a thorough history and physical examination and obtain laboratory and imaging studies to evaluate for medical or neurologic diseases that may explain or partially explain the patient's symptoms when the diagnosis is unclear. Treatment of functional neurologic disorder involves education about the diagnosis, physical therapy, and cognitive-behavioral therapy.

Incorrect Answers: A, C, D, and E.

Body dysmorphic disorder (Choice A) manifests as preoccupation with a perceived flaw in physical appearance leading to repetitive behaviors (eg, checking) or mental acts (eg, comparing appearance to others). This patient is not preoccupied with a flaw in her appearance.

Delusional disorder (Choice C) presents with fixed false beliefs (delusions) in the absence of other psychiatric symptoms such as hallucinations, disorganization, depression, or mania. This patient endorses a worry that she has Parkinson disease but does not insist that she has the disease.

Illness anxiety disorder (hypochondriasis) (Choice D) is characterized by persistent, excessive anxiety and preoccupation about the possibility of having or acquiring a serious illness such that patients perform frequent health-related behaviors (eg, repeatedly going to the doctor) or exhibit maladaptive avoidance (eg, completely avoiding going to the doctor). Patients with illness anxiety disorder do not typically demonstrate neurologic dysfunction. As well, this patient does not demonstrate abnormal or excessive health-related behaviors.

Malingering (Choice E) refers to consciously producing or falsifying symptoms for a purpose such as obtaining disability payments or release from jail. There is no tangible benefit of producing symptoms for this patient.

Educational Objective: Functional neurologic disorder involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. The treatment involves psychotherapy.

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13. A 4-month-old girl is admitted to the hospital because of a 7-day history of progressive cough. During the past 2 days, the cough has been associated with gagging, difficulty breathing, and perioral cyanosis. Between coughing episodes, she is alert and not in respiratory distress. She was born at term following an uncomplicated pregnancy and spontaneous vaginal delivery. Her mother has a 3-week history of nonproductive cough treated with over-the-counter cough syrup. The patient receives no medications. She appears well nourished. Her temperature is 38°C (100.4°F), pulse is 120/min, and respirations are 45/min. Pulse oximetry on room air shows an oxygen saturation of 98%. The lungs are clear to auscultation, and air movement is good. During an observed coughing episode, the patient's lips become cyanotic. Pulse oximetry on room air during the episode shows an oxygen saturation of 85%. Which of the following is the most likely infectious agent?

A) Adenovirus
B) *Bordetella pertussis*
C) *Haemophilus influenzae*
D) *Mycoplasma pneumoniae*
E) Parainfluenza virus
F) Respiratory syncytial virus

Correct Answer: B.

Bordetella pertussis is the most likely infectious agent in this patient with episodes of severe paroxysmal coughing and cyanosis. Pertussis classically presents in three stages. The catarrhal stage is first, which presents with fever, rhinorrhea, and a mild cough. This progresses to the paroxysmal stage after 1 to 2 weeks, in which patients experience violent bouts of extreme coughing, at times violent enough to cause secondary traumatic injury such as rib fractures, urinary incontinence, and pneumothorax. Often, such coughing fits are accompanied by cyanosis and may be followed by syncope, emesis, or apnea. The paroxysmal stage can last for weeks to months. Symptoms resolve during the convalescent stage, which lasts from 1 to 4 weeks. Pertussis toxin causes impaired recruitment and migration of phagocytes and production of inflammatory mediators. Patients often have significant lymphocytosis. Pertussis can be prevented with immunization in the form of acellular pertussis, typically administered along with tetanus toxoid and diphtheria toxoid vaccines. The Centers for Disease Control (CDC) recommends administering the vaccine in a multiple-dose series beginning at 2 months of age. Pertussis is treated with antibiotics, typically macrolides, and supportive care.

Incorrect Answers: A, C, D, E, and F.

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stages. The catarrhal stage is first, which presents with fever, rhinorrhea, and a mild cough. This progresses to the paroxysmal stage after 1 to 2 weeks, in which patients experience violent bouts of extreme coughing, at times violent enough to cause secondary traumatic injury such as rib fractures, urinary incontinence, and pneumothorax. Often, such coughing fits are accompanied by cyanosis and may be followed by syncope, emesis, or apnea. The paroxysmal stage can last for weeks to months. Symptoms resolve during the convalescent stage, which lasts from 1 to 4 weeks. Pertussis toxin causes impaired recruitment and migration of phagocytes and production of inflammatory mediators. Patients often have significant lymphocytosis. Pertussis can be prevented with immunization in the form of acellular pertussis, typically administered along with tetanus toxoid and diphtheria toxoid vaccines. The Centers for Disease Control (CDC) recommends administering the vaccine in a multiple-dose series beginning at 2 months of age. Pertussis is treated with antibiotics, typically macrolides, and supportive care.

Incorrect Answers: A, C, D, E, and F.

Adenovirus (Choice A) can cause a variety of febrile syndromes in children including upper respiratory tract infections. Patients frequently present with respiratory symptoms in addition to conjunctivitis. In some cases, adenovirus can cause pneumonia, gastroenteritis, and otitis media.

Haemophilus influenzae (Choice C) is a gram-negative bacterium that can result in various mucosal infections such as conjunctivitis, otitis media, bronchitis, and pneumonia. It does not lead to paroxysmal coughing followed by cyanotic spells.

Mycoplasma pneumoniae (Choice D) is an atypical organism that can cause pneumonia, which usually presents with fevers, cough, and infiltrates on chest x-ray. Clinical examination typically discloses abnormal breath sounds, and infection does not usually cause paroxysmal cough with apnea.

Parainfluenza virus (Choice E) is a common cause of laryngotracheobronchitis, also known as croup, which typically presents with fever, rhinorrhea, a barking cough, and inspiratory stridor. Stridor refers to a high-pitched sound secondary to turbulent airflow from an underlying upper airway obstruction.

Respiratory syncytial virus (Choice F) commonly results in acute bronchiolitis, which often presents with fever, tachypnea, rhinorrhea, and wheezing. Patients may also display apneic episodes, but severe paroxysms of coughing would be atypical.

Educational Objective: Pertussis is caused by an infection from *Bordetella pertussis* and may lead to severe paroxysmal coughing, which may be accompanied by cyanosis and followed by syncope, emesis, or apnea. Pertussis can be prevented by immunization with the tetanus toxoid, diphtheria toxoid, and acellular pertussis (Tdap) vaccine, which is given as a multiple-dose series beginning at age 2 months.

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14. A metropolitan city has a higher than average rate of obesity-related disability compared with other cities of similar size. The city's director of public health would like to prevent future obesity-related complications for this city's residents. Which of the following is the most appropriate strategy for primary prevention of obesity in this population?

A) Allocate funding to improve the city's bike lanes and walking trails
B) Hire additional diabetic educators
C) Measure BMI in all high school students and offer dietary counseling and exercise programs to obese students
D) Open a bariatric surgical center in the city hospital
E) Sponsor a citywide weight loss initiative and offer prizes for the most weight lost

Correct Answer: A.

Primary prevention strategies aim to prevent the effects of disease before the disease occurs. This is in contrast to other forms of prevention that occur after the onset of disease, such as secondary prevention (which aims to identify disease early in its course through screening efforts) or tertiary prevention (which aims to slow or ameliorate the progression and complications of a disease through therapeutic intervention). An appropriate primary prevention strategy to prevent complications of obesity would aim to prevent the development of obesity and may include measures to improve public access to exercise, such as through the improvement of bike lanes or walking trails.

Incorrect Answers: B, C, D, and E.

Hiring additional diabetic educators (Choice B) is an appropriate tertiary prevention strategy to help patients with diabetes mellitus better understand their disease and manage its complications.

Measuring BMI in all high school students and offering dietary counseling and exercise programs to obese students (Choice C) is an example of a secondary prevention strategy. Secondary prevention strategies employ screening to identify individuals with disease early in their course.

Opening a bariatric surgical center in the city hospital (Choice D) is an example of a tertiary prevention strategy because it would be most useful in ameliorating the

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D) Open a bariatric surgical center in the city hospital

E) Sponsor a citywide weight loss initiative and offer prizes for the most weight lost

Correct Answer: A.

Primary prevention strategies aim to prevent the effects of disease before the disease occurs. This is in contrast to other forms of prevention that occur after the onset of disease, such as secondary prevention (which aims to identify disease early in its course through screening efforts) or tertiary prevention (which aims to slow or ameliorate the progression and complications of a disease through therapeutic intervention). An appropriate primary prevention strategy to prevent complications of obesity would aim to prevent the development of obesity and may include measures to improve public access to exercise, such as through the improvement of bike lanes or walking trails.

Incorrect Answers: B, C, D, and E.

Hiring additional diabetic educators (Choice B) is an appropriate tertiary prevention strategy to help patients with diabetes mellitus better understand their disease and manage its complications.

Measuring BMI in all high school students and offering dietary counseling and exercise programs to obese students (Choice C) is an example of a secondary prevention strategy. Secondary prevention strategies employ screening to identify individuals with disease early in their course.

Opening a bariatric surgical center in the city hospital (Choice D) is an example of a tertiary prevention strategy because it would be most useful in ameliorating the complications of patients who have already developed obesity.

Sponsoring a citywide weight loss initiative and offering prizes for the most weight lost (Choice E) is a potential primary prevention strategy but is less appropriate than improving public access to exercise. Effective primary prevention strategies should be cost-effective and sustainable. Incentivizing weight loss with prizes is likely to produce short-term, non-sustainable behavioral changes.

Educational Objective: Primary prevention strategies aim to prevent the effects of disease before the disease occurs. This is in contrast to other forms of prevention that occur after the onset of disease, such as secondary prevention (which aims to identify disease early in its course through screening efforts) or tertiary prevention (which aims to slow or ameliorate the progression and complications of a disease through therapeutic intervention).

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15. A 57-year-old man with hypertension comes to the office for a routine examination. He feels well. Four years ago, he had basal cell carcinoma on his nose treated with excision. Colonoscopy 5 years ago showed a tubular adenoma. Fifteen years ago, he underwent appendectomy for appendicitis. His medications are hydrochlorothiazide, fish oil supplementation, and a multivitamin. He received the influenza virus vaccine 6 months ago and the tetanus-diphtheria-acellular pertussis vaccine 5 years ago. He does not smoke cigarettes. He drinks 8 to 16 oz of wine nightly and exercises four to five times weekly. He is 183 cm (6 ft) tall and weighs 86 kg (190 lb); BMI is 26 kg/m^2. His pulse is 80/min, and blood pressure is 128/88 mm Hg. Examination shows scattered pale nevi over the chest and back. No other abnormalities are noted. Results of serum lipid studies from 6 months ago are shown:

Cholesterol, total	201 mg/dL
HDL-cholesterol	42 mg/dL
LDL-cholesterol	120 mg/dL
Triglycerides	180 mg/dL

Which of the following is the most appropriate next step in management?

A) Administration of diphtheria-tetanus toxoid
B) Administration of pneumococcal polysaccharide vaccine, 23-valent
C) Colonoscopy
D) ECG
E) Exercise stress test

Correct Answer: C.

The United States Preventive Services Task Force (USPSTF) recommends routine colorectal cancer screening for all patients beginning at age 50 years and continuing until age 75 years. Colorectal cancer is common, and early detection and treatment have been demonstrated to reduce morbidity and mortality. A variety of tests may be used for colorectal cancer screening. Colonoscopy remains the gold standard screening test because it allows direct visualization and excision of polyps throughout the length of the colon. Tubular adenomas are benign polyps but carry malignant potential. The United States Multi-Society Task Force on Colorectal Cancer recommends that patients with low-risk polyps, such as one or two small tubular adenomas, undergo screening with colonoscopy every 5 to 10 years. Patients with multiple polyps (three or

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D) ECG

E) Exercise stress test

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Administration of diphtheria-tetanus toxoid (Choice A) should be performed in adults every 10 years. A booster dose is not indicated in this patient, who received his last dose 5 years ago.

Administration of pneumococcal polysaccharide vaccine, 23-valent (Choice B) should be administered to adults beginning at age 65 years. Adults with a history of cardiac, pulmonary, or liver disease, diabetes mellitus, or with a history of alcohol use disorder may receive the 23-valent pneumococcal vaccine prior to age 65 years.

ECG (Choice D) is not routinely performed as a screening test in patients without cardiac symptoms. The USPSTF recommends against routine ECG screening because ECG results are not useful for risk stratification and may lead to harm by resulting in unnecessary, invasive testing.

Exercise stress test (Choice E) is a useful technique for the diagnosis of coronary vascular disease in patients who experience cardiac symptoms, such as chest pain or dyspnea on exertion. Routine screening of asymptomatic patients with exercise stress testing is not necessary.

Educational Objective: The United States Multi-Society Task Force on Colorectal Cancer recommends that patients with low-risk polyps, such as one or two small, tubular adenomas, undergo screening with colonoscopy every 5 to 10 years. Patients with multiple polyps (three or more), polyps with atypical features or large size, or atypical serrated polyps should undergo more frequent screening every 3 years.

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16. A 39-year-old woman, gravida 3, para 2, is brought to the emergency department because of a 3-hour history of moderate to severe abdominal cramps and vaginal bleeding with clots. Her last menstrual period was 9 weeks ago. Menses previously occurred at regular 30-day intervals and lasted 7 days. Her previous pregnancies and deliveries were uncomplicated. She has no history of serious illness and takes no medications. She is currently homeless and seeking shelter. Her temperature is 37.3°C (99.1°F), pulse is 103/min, respirations are 14/min, and blood pressure is 130/82 mm Hg. Examination shows tenderness to palpation of the mid lower abdomen. Bowel sounds are normal. The uterus is tender to palpation and consistent in size with a 9-week gestation. Pelvic examination shows normal external genitalia, moderate clots in the vaginal vault, and a closed cervical os. There is no adnexal tenderness or masses. Her hemoglobin concentration is 7.9 g/dL. Pelvic ultrasonography shows an intrauterine pregnancy consistent in size with a 9-week gestation; no fetal heart motion; a small amount of fluid in the cul-de-sac; and a subchorionic hemorrhage. Which of the following is the most appropriate next step in management?

A) Administration of ceftriaxone
B) Administration of misoprostol
C) Dilatation and suction curettage
D) Laparoscopy
E) Repeat pelvic ultrasonography in 1 week

Correct Answer: C.

Spontaneous abortion describes the noninduced loss of a fetus prior to 20 weeks' gestation and is subdivided into threatened, inevitable, incomplete, complete, missed, and septic abortion. Threatened abortion presents with vaginal bleeding without an open os or the loss of products of conception. Inevitable abortion presents with vaginal bleeding and an open os and is referred to as an incomplete abortion once the partial passage of products begins. Complete abortion refers to the passage of all products and a closed os. Missed abortion refers to asymptomatic fetal demise without the passage of products. These can be complicated by septic abortion, in which infection occurs within the uterine cavity. Further evaluation of spontaneous abortion includes ultrasonography to determine the presence or absence of a viable fetus and/or remaining products of conception within the uterine cavity. Treatment options include expectant management, medical management (eg, mifepristone and misoprostol), or uterine evacuation with dilation and suction curettage. Surgical management exhibits the highest success rate. Additionally, dilation and suction curettage may be better-suited for patients with decreased access to healthcare.

Incorrect Answers: A, B, D, and E

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Incorrect Answers: A, B, D, and E.

Administration of ceftriaxone (Choice A) may be warranted for the treatment of septic abortion, which presents with pelvic pain, foul-smelling discharge, uterine tenderness, fever, tachycardia, and leukocytosis. However, broad-spectrum antibiotics are more routinely used, and this patient has no signs of infection.

Administration of misoprostol (Choice B) may be considered. However, misoprostol alone is less effective in causing the passage of fetal tissue than when combined with mifepristone. It would likely be less successful in treating the miscarriage than dilation and suction curettage.

Laparoscopy (Choice D) is not warranted because this patient is presenting with a spontaneous abortion, which requires appropriate management and uterine evacuation. Laparoscopy plays no role in the management of spontaneous abortion.

Repeat pelvic ultrasonography in 1 week (Choice E) would be inappropriate for this patient that likely has reduced access to healthcare. Additionally, she is already experiencing significant vaginal bleeding, which would likely persist if she were to undergo conservative management. Dilation and suction curettage would be a more appropriate choice for management in this patient.

Educational Objective: Spontaneous abortion refers to the noninduced loss of a fetus prior to 20 weeks' gestation and can be further subdivided based on the status of cervical opening and location of fetal tissue. It often presents with uterine cramping and vaginal bleeding. Treatment options include expectant management, medical management (eg, mifepristone and misoprostol), or uterine evacuation with dilation and suction curettage.

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17. Three days after undergoing open fixation of a right hip fracture, a 77-year-old woman has progressive edema of the right lower extremity. She has no history of serious illness. Her medications are oxycodone, enoxaparin, and docusate. Her temperature is 38.0°C (100.4°F), pulse is 72/min, respirations are 14/min, and blood pressure is 140/80 mm Hg. There is 3+ pitting edema of the right lower extremity from the foot to the hip. Which of the following is the most likely set of findings on venous duplex ultrasonography?

	Superficial Veins	Deep Veins
A)	Normal	normal
B)	Normal	obstructed
C)	Normal	reflux
D)	Obstructed	normal
E)	Obstructed	reflux

Correct Answer: B.

Deep venous thrombosis (DVT) and venous thromboembolism (VTE) are major causes of morbidity and mortality among hospitalized patients and are particularly common in patients undergoing surgery. A variety of patient-related and surgery-related factors contribute to the formation of DVTs including hypercoagulability or malignancy, surgical technique, and the degree of immobilization following surgery. Knee and hip arthroplasty are considered high-risk for DVT because prolonged immobilization is typically required postoperatively. Patients undergoing major surgery should be given prophylaxis to prevent the development of DVT and VTE. Subcutaneous low-molecular-weight heparin, such as enoxaparin, is the preferred first-line agent because of its high efficacy, ease of dosing, affordability, and low risk for major bleeding. However, despite these measures, DVTs can still develop, and they most commonly present with erythema, warmth, and edema in the affected extremity. Diagnosis is made with duplex ultrasonography, which will most likely show obstruction of the deep veins with normal superficial veins.

Incorrect Answers: A, C, D, and E.

Deep veins will be obstructed in the setting of a DVT because of thrombus formation, rather than normal (Choices A and D) or appearing with evidence of reflux (Choices C and E). While superficial veins can develop thrombophlebitis and become obstructed, with tenderness to palpation and erythema overlying the vein, this would not likely

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venous duplex ultrasonography?

	Superficial Veins	Deep Veins
A)	Normal	normal
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Incorrect Answers: A, C, D, and E.

Deep veins will be obstructed in the setting of a DVT because of thrombus formation, rather than normal (Choices A and D) or appearing with evidence of reflux (Choices C and E). While superficial veins can develop thrombophlebitis and become obstructed, with tenderness to palpation and erythema overlying the vein, this would not likely lead to significant extremity edema.

Educational Objective: Deep venous thrombosis (DVT) is common in postsurgical patients, especially following knee and hip arthroplasty. It often presents with erythema, warmth, and edema of the affected extremity. Diagnosis is made with duplex ultrasonography, which will most likely show obstruction of the deep veins.

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18. A 15-year-old girl is brought to the office by her father because of a 2-month history of yellowing of her eyes. She has no history of serious illness and takes no medications. She is at the 50th percentile for height, weight, and BMI. Vital signs are within normal limits. Examination shows conjunctival icterus. Serum studies show a total bilirubin concentration of 4 mg/dL and a conjugated bilirubin concentration of 3 mg/dL. Results of other liver function tests are within the reference ranges. Ultrasonography of the liver shows no abnormalities. Which of the following is the most likely diagnosis?

A) Autoimmune hepatitis
B) Cholelithiasis
C) Dubin-Johnson syndrome
D) Gilbert syndrome
E) Hemolytic anemia
F) Viral hepatitis

Correct Answer: C.

Dubin-Johnson syndrome is the most likely diagnosis in this patient with asymptomatic conjugated hyperbilirubinemia in the absence of other increased liver-associated enzymes. Dubin-Johnson syndrome occurs as a result of defective hepatocellular excretion of conjugated bilirubin into the bile canaliculi. Transportation of conjugated bilirubin into the bile ducts is an ATP-dependent mechanism; it occurs via the action of a pump called the multidrug resistance related protein (MRP2), which is encoded by the ABCC2 gene. Many patients with Dubin-Johnson syndrome possess mutations in this gene that lead to accumulation of conjugated (direct) bilirubin. This condition is considered benign, and most patients only come to medical attention when they develop icterus or jaundice. No treatment is warranted.

Incorrect Answers: A, B, D, E, and F.

Autoimmune hepatitis (Choice A) presents in a range from asymptomatic to fulminant hepatitis; typically, the presentation includes chronic nonspecific symptoms such as fatigue, weight loss, jaundice, nausea, vomiting, pruritis, and right upper quadrant abdominal discomfort. An enlarged, tender liver is sometimes found on examination. It is most often seen in females, often in middle age. Laboratory studies show transaminase increases, and often an increased anti-smooth muscle antibody.

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F) Viral hepatitis

Correct Answer: C.

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Cholelithiasis (Choice B) refers to the presence of gallstones in the gallbladder. Patients with this condition frequently present with biliary colic, which is described a sharp, intermittent pain in the right upper quadrant after meals and which results from transient obstruction of the cystic duct.

Gilbert syndrome (Choice D) is a disorder of bilirubin conjugation and presents with unconjugated hyperbilirubinemia, not conjugated hyperbilirubinemia. It is also a benign condition.

Hemolytic anemia (Choice E) can cause jaundice as a result of indirect hyperbilirubinemia from lysed erythrocytes, but it does not generally present with increased conjugated bilirubin concentration. Additionally, symptoms related to anemia such as fatigue would be expected.

Viral hepatitis (Choice F) can be either acute or chronic. Most patients present with fatigue, abdominal pain, and increased concentrations of liver-associated enzymes.

Educational Objective: Dubin-Johnson syndrome is a disorder of conjugated bilirubin excretion and usually occurs as a result of mutations in an enzyme that is involved in this process. Patients present with asymptomatic conjugated hyperbilirubinemia. Treatment is not necessary as the condition is benign.

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19. A hospitalized 65-year-old woman is prepared for discharge 15 days after undergoing uncomplicated surgical repair of the ventricular septum following an anterior ST-segment elevation myocardial infarction. Her postoperative course has been uncomplicated. She has hypertension and hyperlipidemia. Her medications are clopidogrel, lisinopril, metoprolol, atorvastatin, and aspirin. Vital signs are within normal limits. Examination shows a clean, dry surgical incision. Echocardiography shows an ejection fraction of 50%. In addition to continuation of the medication regimen, which of the following interventions is most likely to decrease this patient's risk for a repeat myocardial infarction?

A) Antioxidant supplementation
B) Following a Mediterranean diet
C) Implantation of a cardiac defibrillator
D) Limiting physical activity
E) Omeprazole therapy
F) Warfarin therapy

Correct Answer: B.

Following a Mediterranean diet is the most appropriate additional intervention to reduce the likelihood that this patient will experience another myocardial infarction (MI). The Mediterranean diet consists primarily of a diet high in vegetables, whole grains, legumes, and olive oil, with moderate consumption of fish, poultry, and low-fat dairy products in addition to wine. This diet has been shown to reduce cardiovascular mortality, including MI and stroke, in patients without known coronary heart disease as well as in patients with established coronary disease, such as this patient. It has a favorable effect on lipids, blood pressure, and insulin sensitivity.

Incorrect Answers: A, C, D, E, and F.

Antioxidant supplementation (Choice A) has not been proven to reduce cardiovascular mortality in patients with established coronary artery disease.

Implantation of a cardiac defibrillator (Choice C) is indicated if the ejection fracture remains depressed at least 40 days after myocardial infarction despite maximal medical therapy. This patient has a normal ejection fraction.

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E) Omeprazole therapy

F) Warfarin therapy

Correct Answer: B.

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Incorrect Answers: A, C, D, E, and F.

Antioxidant supplementation (Choice A) has not been proven to reduce cardiovascular mortality in patients with established coronary artery disease.

Implantation of a cardiac defibrillator (Choice C) is indicated if the ejection fracture remains depressed at least 40 days after myocardial infarction despite maximal medical therapy. This patient has a normal ejection fraction.

Limiting physical activity (Choice D) may be considered for some patients following myocardial infarction in the period immediately following their event, but all patients should be referred to cardiac rehabilitation to gradually increase their exercise in a supervised environment.

Omeprazole therapy (Choice E) should be considered in patients with a history of gastrointestinal (GI) bleeding who are on dual antiplatelet agents, but this patient does not have a history of GI bleeding, so this medication is not necessary.

Warfarin therapy (Choice F) is not indicated in this patient because there is no evidence of atrial fibrillation and venous thromboembolism, and she retains all of her native cardiac valves.

Educational Objective: The Mediterranean diet is high in fresh fruits, vegetables, and legumes. It is proven to reduce cardiovascular morbidity and mortality in patients both with and without established coronary artery disease.

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20. An 18-year-old woman who is a US Army recruit comes to the troop medical clinic because of a 4-day history of increasingly severe cramping and swelling of her left foot. She began basic training 10 days ago. She had not been physically active before joining the army. Initially, she was able to keep up with the training regimen, but she soon developed pain in her forefoot as the intensity of the exercise increased. Vital signs are within normal limits. She is 165 cm (5 ft 5 in) tall and weighs 68 kg (150 lb); BMI is 25 kg/m^2. Examination of the left foot shows tenderness to palpation of the dorsal aspect of the fifth metatarsal; there is minimal swelling. Movement of the involved toe elicits pain. X-ray of the left foot shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Bisphosphonate therapy
B) Cast immobilization
C) Indomethacin therapy
D) Use of arch supports in boots
E) Reassurance only

Correct Answer: B.

Cast immobilization is the most appropriate next step in management of this patient who likely has a stress fracture of the fifth metatarsal. Stress fractures are considered an overuse injury where bone is subjected to repetitive stress, resulting in linear microfractures in trabecular bone. This is commonly seen in patients such as long-distance runners and military recruits, particularly patients who have traditionally been sedentary and suddenly increase their training tempo. Patients may present with slowly progressive pain at the site of the stress fracture (eg, tibia, metatarsals), initially worse with application of stress, but then possibly progressing to pain with daily activities if not treated appropriately. X-ray may show a component of periosteal/endosteal thickening, although they are often insensitive and may show no abnormalities. In cases where the diagnosis is unclear, a bone scan is highly sensitive for identifying stress fractures. Treatment is with immobilization and rest for a period of several weeks.

Incorrect Answers: A, C, D, and E.

Bisphosphonate therapy (Choice A) is indicated for patients with osteoporosis or osteopenia with a high fracture risk assessment score (FRAX). These conditions are far

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D) Use of arch supports in boots

E) Reassurance only

Correct Answer: B.

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Incorrect Answers: A, C, D, and E.

Bisphosphonate therapy (Choice A) is indicated for patients with osteoporosis or osteopenia with a high fracture risk assessment score (FRAX). These conditions are far more common in postmenopausal women and would be highly unusual in a young, otherwise healthy woman.

Indomethacin therapy (Choice C) is an appropriate treatment for acute gout flares in patients without renal disease. Gout usually presents with an acutely red, swollen, and painful joint.

Use of arch supports in boots (Choice D) is encouraged for patients with flat feet or with plantar fasciitis. This patient's pain is more likely secondary to a stress fracture, which is treated with immobilization.

Reassurance only (Choice E) would be inappropriate. Continued physical activity could lead to a complete fracture of the metatarsal.

Educational Objective: Stress fractures are considered an overuse injury and result from linear microfractures of trabecular bone in the setting of repeated physical stress. They are common in patients who acutely and dramatically increase the tempo of their training and frequently present with insidious pain at the site of fracture. X-rays may be normal, and treatment is with rest and immobilization for a period of weeks.

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21. A 24-year-old woman comes to the physician because of fever, headache, and purulent nasal discharge for 5 days. She has had recurrent sinus infections since the age of 17 years. She has a 3-year history of chronic nasal stuffiness and a morning cough productive of 2 to 3 teaspoons of purulent sputum daily. She was hospitalized for treatment of pneumonia 1 year ago. Her temperature is 37.8°C (100°F), pulse is 84/min, respirations are 16/min, and blood pressure is 110/72 mm Hg. Examination shows edema of the nasal mucosa and a creamy yellow nasal exudate. The lungs are clear to auscultation. The spleen tip is palpated at the left costal margin. Which of the following is the most appropriate next step to confirm the mechanism for the recurrent infections?

A) Measurement of serum immunoglobulin concentrations
B) Sputum culture
C) CT scan of the chest
D) Liver-spleen scan
E) Bone marrow aspiration and biopsy

Correct Answer: A.

Measurement of serum immunoglobulin concentrations is the most appropriate next step in the evaluation of this patient with recurrent sinopulmonary infections and splenomegaly. This constellation of symptoms is concerning for common variable immunodeficiency disease (CVID). CVID classically presents in the second to fourth decades of life as multiple, recurrent sinus or pulmonary infections, including pneumonia, bronchitis, and sinusitis. Chronic lung infections can result in bronchiectasis, and infections of the gastrointestinal tract are also frequently encountered. Patients with CVID are at an increased risk for the development of autoimmune disease such as rheumatoid arthritis, autoimmune hemolytic anemia, and autoimmune thyroid disease. Additionally, they have a higher risk for cancer, especially gastric cancer and non-Hodgkin lymphoma. The diagnosis is made by quantitative measurement of serum immunoglobulins, which universally shows decreased concentrations of IgG, IgA, and/or IgM. The pathogenesis involves impaired B-lymphocyte differentiation into plasma cells and therefore impaired production of immunoglobulins. As a result of failed antibody production, patients have a blunted and sometimes absent response to immunization, which is supportive of the diagnosis in patients with classic findings. Treatment is with intravenous immune globulin (IVIG).

Incorrect Answers: B, C, D, and E.

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Incorrect Answers: B, C, D, and E.

Sputum culture (Choice B) may provide an organism to target with antibiotics, but this patient would be better served with an evaluation for the underlying disorder that has predisposed her to recurrent sinopulmonary infections.

CT scan of the chest (Choice C) may show findings consistent with pneumonia or bronchiectasis, but it would not diagnose the underlying disease process, which is likely CVID.

Liver-spleen scan (Choice D) is unnecessary. Splenomegaly is common in patients with CVID although the exact pathogenesis is unknown. Liver disease, particularly nodular regenerative hyperplasia, is also common, although this can only be diagnosed with a liver biopsy.

Bone marrow aspiration and biopsy (Choice E) would be indicated if this patient had features other than splenomegaly that were suggestive of lymphoma, such as fevers, night sweats, weight loss, and/or an abnormal peripheral blood smear.

Educational Objective: CVID occurs as a result of impaired B-lymphocyte differentiation into plasma cells, thereby leading to reduced or absent concentrations of IgG, IgA, and/or IgM. Patients usually present with recurrent sinopulmonary infections but are also at risk for liver disease, autoimmune disease, and malignancies. Diagnosis is made by measuring immunoglobulin concentration, and treatment is with IVIG.

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22. A 4-year-old boy is brought to the physician because of scalp lesions that have been increasing in size during the past week. He went for a nature walk with his day-care class 10 days ago. Examination shows scattered papules with some scaly areas on the scalp; the surrounding hair is broken near the base with mild alopecia. Which of the following is most likely to have prevented this condition?

A) Avoidance of wooded areas
B) Avoidance of sharing hats
C) Use of insect repellent
D) Use of a medicated shampoo
E) Use of sunscreen

Correct Answer: B.

Tinea capitis can be prevented by avoiding use of objects which have been in contact with an affected individual's scalp, such as a hat, comb, or pillowcase. Tinea capitis is a fungal infection of the scalp that is common in children. The most common presentation is scaly patches with alopecia and concomitant lymphadenopathy. The patches of alopecia may also demonstrate black dots that represent broken hairs or pustules. When a significant inflammatory response to the fungal infection develops, a kerion develops. This is indicated by a boggy texture and swollen appearance on examination, which is not present in this case. Tinea capitis is caused by dermatophytes including *Trichophyton tonsurans, Epidermophyton floccosum, Microsporum canis,* and *Microsporum gypseum*. First-line treatment of tinea capitis is with an oral antifungal, usually griseofulvin or terbinafine. Close contacts of patients should also be examined because tinea capitis is very contagious and can be spread through fomites, such as shared combs, pillows, or hats.

Incorrect Answers: A, C, D, and E.

Avoidance of wooded areas (Choice A) is not useful in preventing tinea capitis because it is not caused by an insect or other exposure encountered in a forested area. Use of insect repellent (Choice C) is also not preventative. Dermatologic conditions which may be prevented by avoiding forested areas could include allergic contact dermatitis to poison ivy, oak, or sumac, acute onset hives from stinging nettle, or Lyme disease caused by transmission of *Borellia burgdorferi* by the *Ixodes scapularis* tick.

Use of a medicated shampoo (Choice D) neither prevents nor adequately treats tinea capitis. While seborrheic dermatitis, or dandruff, caused by *Malassezia furfur*

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D) Use of a medicated shampoo

E) Use of sunscreen

Correct Answer: B.

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Use of a medicated shampoo (Choice D) neither prevents nor adequately treats tinea capitis. While seborrheic dermatitis, or dandruff, caused by *Malassezia sympodialis* can be treated with antifungal shampoo, tinea capitis requires systemic antifungal treatment.

Use of sunscreen (Choice E) does not impact the rate of development of tinea capitis. Use of sunscreen decreases the incidence of photosensitive or phototoxic disorders such as sunburn, drug-induced phototoxicity, or polymorphous light eruption. Use of sunscreen may also decrease future risk for skin cancers such as basal cell carcinoma, squamous cell carcinoma, and melanoma.

Educational Objective: Tinea capitis is a fungal infection of the scalp that is common in children. Primary treatment is with systemic griseofulvin, but an equally important aspect of treatment is discarding contaminated fomites and not sharing them with other individuals. Contact with a contaminated fomite is a common cause for spread and reinfection after cure.

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23. A 72-year-old woman comes to the emergency department because of a 2-week history of increased thirst and frequent urination. She says that her symptoms have been getting worse. She drinks copious amounts of water and now urinates every 1 to 2 hours. She has hypertension controlled with ramipril. She had a myocardial infarction 6 years ago. On arrival, she appears dehydrated. Her temperature is 36°C (96.8°F), pulse is 110/min, and blood pressure is 100/70 mm Hg. Examination shows dry mucous membranes. Cardiopulmonary examination shows no abnormalities. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hematocrit	47%
Serum	
Na^+	125 mEq/L
K^+	3.5 mEq/L
Cl^-	95 mEq/L
HCO_3^-	24 mEq/L
Urea nitrogen	30 mg/dL
Glucose	700 mg/dL
Creatinine	1.8 mg/dL

Which of the following is the most likely cause of this patient's serum sodium concentration?

A) Adverse effect of ramipril
B) Hyperglycemia
C) Increased intake of free water
D) Increased renal excretion of sodium
E) Increased secretion of ADH (vasopressin)

Correct Answer: B.

The cause of this patient's hyponatremia is hyperglycemia which is causing a nonketotic hyperosmolar state. The first step in identifying the cause of hyponatremia is

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Which of the following is the most likely cause of this patient's serum sodium concentration?

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C) Increased intake of free water
D) Increased renal excretion of sodium
E) Increased secretion of ADH (vasopressin)

Correct Answer: B.

The cause of this patient's hyponatremia is hyperglycemia which is causing a nonketotic hyperosmolar state. The first step in identifying the cause of hyponatremia is calculating the serum osmolality. Serum osmolality = (2*Na) + (BUN/2.8) + (glucose/18). When serum osmolality is >295, as in this case (serum Osm = 300), then hypertonic hyponatremia is present. This is caused by excessive solute in the plasma such as glucose, mannitol, or contrast agents. These agents cause movement of water from intracellular to extracellular spaces, causing dilution of sodium in the process. In this case, the patient has an extremely elevated glucose which is also causing hyperosmolar hyperglycemic nonketotic (HHNK) state. HHNK, also known as hyperosmolar hyperglycemic state (HHS), is a condition of severe hyperglycemia and increased serum osmolality resulting in profound dehydration, without the abnormal production of ketones. This typically occurs in patients with type 2 diabetes mellitus after an inciting stress event, such as an acute infection. The increased osmolality results in excessive osmotic diuresis in the kidneys, which leads to progressive, marked dehydration. Presenting symptoms include lethargy, thirst, polyuria, altered mental status, and potential coma and death if untreated. Laboratory studies typically show hyperglycemia (>500 mg/dL), and increased osmolality without acidosis because of the lack of ketone production. Treatment requires aggressive fluid resuscitation with isotonic intravenous fluids and insulin.

Incorrect Answers: A, C, D, and E.

Adverse effects of ramipril (Choice A), an ACE inhibitor, include excessive blood pressure decrease leading to hypotension, reduced glomerular filtration rate, hyperkalemia, cough, and angioedema. Hyponatremia is not a common adverse effect.

Increased intake of free water (Choice C) occurs in primary polydipsia and leads to dilutional hyponatremia. It is typically a hypotonic, euvolemic form of hyponatremia. This may be seen in patients with psychiatric conditions (psychogenic polydipsia) or in patients whose thirst centers are impaired (sarcoidosis).

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Increased renal excretion of sodium (Choice D) could be caused by decreased aldosterone. Aldosterone promotes reabsorption of sodium in the distal convoluted tubule and collecting ducts, causing indirect reabsorption of water, and to a lesser extent than the water reabsorption that occurs with ADH. Decreased aldosterone would lead to decreased sodium and water reabsorption and would also present with metabolic acidosis. This patient does not have other signs of adrenal insufficiency.

Increased secretion of ADH (vasopressin) (Choice E) results in excessive free water retention and hypotonic, euvolemic hyponatremia. SIADH is most commonly seen in the setting of small cell lung carcinoma, intracranial pathology, or as an adverse effect of many medications. In this case, the patient is hypertonic and hypovolemic.

Educational Objective: When investigating the cause of hyponatremia, calculating serum osmolality is an important first step. When serum osmolality is high, such as during a hyperosmolar hyperglycemic nonketotic (HHNK) state, hyponatremia occurs. Addressing the underlying HHNK state with intravenous fluids and insulin will resolve the hyponatremia.

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24. A 19-year-old college student comes to the student health center for a physical examination prior to participation in a school intramural basketball league. She has been generally healthy. She says that she is a strict vegetarian and does not eat any meat, eggs, or dairy products. She takes an iron supplement daily. She takes no other medications. She is 162 cm (5 ft 4 in) tall and weighs 45 kg (100 lb); BMI is 17 kg/m^2. Vital signs are normal. Physical examination shows no abnormalities. Which of the following additional supplements is most appropriate to recommend at this time?

A) Vitamin B_{12} (cyanocobalamin)
B) Vitamin B_2 (riboflavin)
C) Vitamin C
D) Folic acid
E) Thiamine

Correct Answer: A.

Vitamin B_{12}, or cobalamin, is a water-soluble B vitamin that is essential for the proper health of neural and hematopoietic tissue. Dietary sources of vitamin B_{12} primarily include animal sources, such as meat, milk, or eggs. Vitamin B_{12} deficiency is rarely caused by dietary deficiency in developed countries but may occur in cases of strict veganism or vegetarianism. Common causes of vitamin B_{12} deficiency include gastrointestinal malabsorption caused by conditions such as pernicious anemia, malabsorption caused by bariatric surgery, Celiac or Crohn disease, bacterial small bowel overgrowth, or infection with the fish tapeworm *Diphyllobothrium latum*. Vitamin B_{12} deficiency presents with macrocytic anemia and associated generalized symptoms of fatigue, pallor, and lightheadedness. Vitamin B_{12} deficiency may be distinguished from vitamin B_9, or folate, deficiency by the presence of neuropsychiatric symptoms, specifically subacute combined degeneration, which presents with ataxic gait, muscle weakness, paresthesia, abnormal deep tendon reflexes, and loss of proprioception and vibration sense. Vegetarians and vegans are also at increased risk for deficiencies of iron, calcium, zinc, protein, and fatty acids. Patients adhering to strict diets benefit from a daily multivitamin to prevent vitamin deficiency.

Incorrect Answers: B, C, D, and E.

Vitamin B_2 (riboflavin) (Choice B) deficiency is characterized by inflammation and cracking of skin around the lips, mouth, and tongue. Riboflavin can be found in a variety of plant sources, such as leafy greens, legumes, and mushrooms. It is not commonly deficient in patients adhering to a vegetarian diet.

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Incorrect Answers: B, C, D, and E.

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Vitamin C (Choice C) is found in fruits and vegetables, and is necessary for collagen synthesis, iron absorption, immune function, and conversion of dopamine to norepinephrine. Deficiency causes Scurvy, characterized by swollen gums, bruising and poor wound healing, petechiae, perifollicular and subperiosteal hemorrhages, and short, fragile, curly hair.

Folic acid (Choice D) is converted to tetrahydrofolic acid and used as a coenzyme in the synthesis of nucleotides and nucleosides. Folate is contained in leafy vegetables and absorbed in the jejunum. Folate deficiency is often seen in patients with malnutrition, alcohol use disorder, and patients taking anti-folate medications (eg, phenytoin, methotrexate). Megaloblastic anemia occurs in the setting of impaired DNA synthesis.

Thiamine (Choice E), also known as vitamin B_1, is a cofactor for several enzymes in glucose metabolism and adenosine triphosphate production, including pyruvate dehydrogenase and α-ketoglutarate dehydrogenase. Deficiency is characterized by Wernicke encephalopathy, a triad of confusion, ophthalmoplegia, and ataxia. Wernicke encephalopathy is theoretically reversible with administration of high-dose thiamine; if untreated, it can progress to Korsakoff syndrome which is characterized by dementia, confabulation, hallucinations, and psychosis.

Educational Objective: Vitamin B_{12} deficiency may occur in vegetarians or vegans, as well as in patients with pernicious anemia, malabsorption, or gastrointestinal infections. It typically presents with macrocytic anemia and generalized symptoms of fatigue, pallor, and lightheadedness, and it may lead to subacute combined degeneration.

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25. A 9-year-old boy is brought to the physician by his mother because of a 1-month history of intermittent nonproductive cough. The cough is exacerbated with exercise and is worse at night. He has not had fever. The patient's father received the diagnosis of asthma as a child. The patient's temperature is 37.3°C (99.1°F), pulse is 90/min, respirations are 22/min, and blood pressure is 108/70 mm Hg. Examination shows no other abnormalities. Pulmonary function tests are most likely to show which of the following findings in this patient?

	FEV_1	FVC	Total Lung Capacity
A)	Decreased	decreased	decreased
B)	Decreased	increased	decreased
C)	Decreased	normal	increased
D)	Normal	decreased	normal
E)	Normal	increased	normal
F)	Normal	normal	increased

Correct Answer: C.

Asthma is characterized by reversible obstruction to airflow caused by spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. It may also present with an isolated cough. Patients in whom asthma is suspected should undergo spirometry with measurement of the 1-second forced-expiratory volume (FEV_1) and the forced vital capacity (FVC). Spirometry or pulmonary function testing will disclose an obstructive pattern, characterized by a decreased FEV_1, normal FVC, and increased total lung capacity. Since asthma is a reversible and episodic condition, spirometry is frequently normal unless the patient is exhibiting symptoms at or around the time of testing. Therefore, most patients undergo a methacholine challenge test. Methacholine is a potent stimulator of bronchoconstriction. As asthma is defined by airway hyperreactivity, patients with asthma tend to experience bronchospasm at lower doses of methacholine than patients without asthma. An improvement in FEV_1 by at least 12% and 200 milliliters with subsequent bronchodilator administration is diagnostic of asthma. Treatment depends on the severity but may include short-acting bronchodilators and/or inhaled corticosteroids.

Incorrect Answers: A, B, D, E, and F.

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F)	Normal	normal	increased

Correct Answer: C.

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Incorrect Answers: A, B, D, E, and F.

Choice A corresponds to a restrictive pattern of lung disease, which would not be expected in a child with asthma. Restrictive lung disease is characterized by a decrease in FEV_1, FVC, and TLC, and an FEV_1/FVC ratio greater than 80%. Similarly, choice B is incorrect. While restrictive lung patterns are often associated with an FEV_1/FVC ratio greater than 80%, FVC is typically normal or slightly reduced, rather than increased. The increased FEV_1/FVC ratio is caused by a limited decrease in FEV_1 rather than an increase in FVC.

Choice D and Choice E are characterized by isolated abnormalities of FVC, which are characteristic of neither obstructive nor restrictive disease. In both patterns, decreases in FVC are accompanied by varying extents of a decrease in FEV_1.

Choice F is characterized by an increased TLC. While TLC is often increased in patients with asthma, there are typically accompanying abnormalities of FEV_1 and FVC. An isolated increased TLC can be observed in patients with tall stature, in athletes, or in patients who live at high altitude.

Educational Objective: Asthma is characterized by reversible obstruction to airflow caused by spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. It may also present with an isolated cough. Spirometry or pulmonary function testing during an exacerbation will disclose an obstructive pattern characterized by a decreased FEV_1, normal FVC, and increased total lung capacity.

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26. Thirty-six hours after cesarean delivery because of prolonged labor, a 22-year-old woman has abdominal cramping and nausea and vomiting. Her temperature is 38.8°C (101.8°F), pulse is 98/min, and blood pressure is 110/64 mm Hg. Examination shows diffuse lower abdominal tenderness with some voluntary guarding but no rebound. The incision is clean, dry, and intact. Her leukocyte count is 15,000/mm^3. A urinary catheter is in place; urinalysis shows multiple RBCs. Which of the following is the most likely diagnosis?

A) Appendicitis
B) Cystitis
C) Endometritis
D) Intra-abdominal hemorrhage
E) Normal findings after cesarean delivery

Correct Answer: C.

Endometritis is a relatively common cause of postpartum infection and often presents with fever and uterine tenderness. Symptoms may also include vaginal bleeding and purulent vaginal discharge. Laboratory studies will commonly show leukocytosis. It is most commonly caused by a polymicrobial infection that ascends from the genital tract into the uterine cavity. Risk factors include cesarean delivery, genital tract infection (eg, bacterial vaginosis), prolonged labor or rupture of membranes, recurrent cervical examinations, manual placenta removal, operative vaginal delivery, and colonization with group B *Streptococcus*, among others. Complications include toxic shock syndrome, clostridial infection, peritonitis, sepsis, and necrotizing fasciitis or myometritis. Treatment includes intravenous antibiotic therapy, with severe disease occasionally requiring wound debridement and/or hysterectomy.

Incorrect Answers: A, B, D, and E.

Appendicitis (Choice A) typically presents with periumbilical abdominal pain that migrates to the right lower quadrant of the abdomen, along with nausea, anorexia, fever, leukocytosis, and tenderness to palpation. It typically presents with a gradually worsening course over hours to days and would be less likely in this postpartum patient than endometritis.

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E) Normal findings after cesarean delivery

Correct Answer: C.

Endometritis is a relatively common cause of postpartum infection and often presents with fever and uterine tenderness. Symptoms may also include vaginal bleeding and purulent vaginal discharge. Laboratory studies will commonly show leukocytosis. It is most commonly caused by a polymicrobial infection that ascends from the genital tract into the uterine cavity. Risk factors include cesarean delivery, genital tract infection (eg, bacterial vaginosis), prolonged labor or rupture of membranes, recurrent cervical examinations, manual placenta removal, operative vaginal delivery, and colonization with group B *Streptococcus*, among others. Complications include toxic shock syndrome, clostridial infection, peritonitis, sepsis, and necrotizing fasciitis or myometritis. Treatment includes intravenous antibiotic therapy, with severe disease occasionally requiring wound debridement and/or hysterectomy.

Incorrect Answers: A, B, D, and E.

Appendicitis (Choice A) typically presents with periumbilical abdominal pain that migrates to the right lower quadrant of the abdomen, along with nausea, anorexia, fever, leukocytosis, and tenderness to palpation. It typically presents with a gradually worsening course over hours to days and would be less likely in this postpartum patient than endometritis.

Cystitis (Choice B) most commonly presents with urinary frequency and urgency, dysuria, and suprapubic abdominal discomfort. Localized cystitis is unlikely to cause systemic infection with fever, and a urinalysis would likely show positive leukocyte esterase and nitrites if cystitis were present.

Intra-abdominal hemorrhage (Choice D) can occur following cesarean delivery. However, in the setting of significant abdominal hemorrhage, the patient would likely be experiencing more pronounced tachycardia and hypotension. Fever would be unlikely to be her presenting complaint.

Normal findings after cesarean delivery (Choice E) is incorrect. While mild abdominal tenderness may be present after a cesarean delivery, the significant fever seen in this patient would be unlikely. Fever is more indicative of an ongoing infection.

Educational Objective: Endometritis is a common cause of postpartum fever and uterine tenderness. Risk factors include cesarean delivery, genital tract infection (eg, bacterial vaginosis), prolonged labor or rupture of membranes, recurrent cervical examinations, manual placenta removal, operative vaginal delivery, and colonization with group B *Streptococcus*. Treatment is with intravenous antibiotics.

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27. A 67-year-old man with aortic stenosis comes to the physician for prophylaxis before undergoing a dental procedure. He has a history of aortic valve replacement; he is currently asymptomatic. He had an episode of hives several years ago after treatment with penicillin. Vital signs are within normal limits. Examination shows a grade 2/6, systolic ejection murmur; no gallops are heard. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate antibiotic for prophylaxis?

A) Ampicillin
B) Clarithromycin
C) Levofloxacin
D) Metronidazole
E) Trimethoprim-sulfamethoxazole
F) Vancomycin

Correct Answer: B.

Infective endocarditis prophylaxis is recommended for patients with high-risk cardiac features undergoing procedures that put them at increased risk for the development of bacterial endocarditis. These cardiac features include prosthetic heart valves (as in this patient), prosthetic valve repair material, prior infective endocarditis, unrepaired congenital cyanotic heart disease, or repaired cyanotic heart disease with residual shunts or valvular regurgitation near prosthetic material, repaired congenital defects with a catheter-based intervention (for the first 6 months after the procedure), and valvular regurgitation in a heart transplant recipient. High-risk procedures include dental procedures with gingival manipulation or perforation of the oral mucosa, respiratory tract procedures in which the mucosa is violated, procedures on infected soft tissue, and cardiac surgery with prosthetic material. Amoxicillin is the most commonly prescribed antibiotic for bacterial endocarditis prophylaxis; however, macrolides (eg, clarithromycin) can be used in patients that are allergic to penicillins. These antibiotics cover the gram-positive organisms (staphylococci, streptococci, enterococci) that are most likely to cause bacterial endocarditis.

Incorrect Answer: A, C, D, E, and F.

Ampicillin (Choice A) can be used for prophylaxis in patients that are unable to take oral medications. However, this patient has an allergy to penicillins, making ampicillin

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Infective endocarditis prophylaxis is recommended for patients with high-risk cardiac features undergoing procedures that put them at increased risk for the development of bacterial endocarditis. These cardiac features include prosthetic heart valves (as in this patient), prosthetic valve repair material, prior infective endocarditis, unrepaired congenital cyanotic heart disease, or repaired cyanotic heart disease with residual shunts or valvular regurgitation near prosthetic material, repaired congenital defects with a catheter-based intervention (for the first 6 months after the procedure), and valvular regurgitation in a heart transplant recipient. High-risk procedures include dental procedures with gingival manipulation or perforation of the oral mucosa, respiratory tract procedures in which the mucosa is violated, procedures on infected soft tissue, and cardiac surgery with prosthetic material. Amoxicillin is the most commonly prescribed antibiotic for bacterial endocarditis prophylaxis; however, macrolides (eg, clarithromycin) can be used in patients that are allergic to penicillins. These antibiotics cover the gram-positive organisms (staphylococci, streptococci, enterococci) that are most likely to cause bacterial endocarditis.

Incorrect Answer: A, C, D, E, and F.

Ampicillin (Choice A) can be used for prophylaxis in patients that are unable to take oral medications. However, this patient has an allergy to penicillins, making ampicillin therapy contraindicated.

Levofloxacin (Choice C) is a respiratory fluoroquinolone used to treat infections such as pneumonia and sinusitis. It is not used for bacterial endocarditis prophylaxis.

Metronidazole (Choice D) is commonly used to treat infections caused by anaerobic bacteria, such as intra-abdominal abscesses and *Clostridium difficile* colitis. It is not routinely used in the treatment or prevention of bacterial endocarditis.

Trimethoprim-sulfamethoxazole (Choice E) can be used to treat a variety of infections, such as urinary tract infections and skin and soft tissue infections. While it may be effective against staphylococci and streptococci, it is not effective against enterococci.

Vancomycin (Choice F) is used to treat infections caused primarily by methicillin-resistant *Staphylococcus aureus*. It is less effective against other infectious organisms that cause bacterial endocarditis. While it may be used to treat endocarditis, it is not commonly a medication chosen for prophylaxis.

Educational Objective: Infective endocarditis prophylaxis should be administered to patients at a high-risk for bacterial endocarditis development undergoing dental procedures with gingival manipulation, respiratory tract procedures that violate the mucosa, procedures on infected skin tissue, and cardiac procedures involving prosthetic material. The drug of choice for prophylaxis is amoxicillin, but macrolides (eg, clarithromycin) can be used for patients allergic to penicillins.

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28. A 32-year-old woman comes to the emergency department because of progressive shortness of breath during the past week. She now becomes short of breath after walking 10 feet. She says that she thinks she has had fever but has not taken her temperature. She does not think she has been in contact with any ill persons. She has smoked one pack of cigarettes daily for 15 years. She does not drink alcohol but has used intravenous heroin for 10 years; she rarely shares or sterilizes needles. She lives in Massachusetts and has not traveled outside of the state in 8 years. She is in mild respiratory distress. She is 168 cm (5 ft 6 in) tall and weighs 50 kg (110 lb); BMI is 18 kg/m^2. Her temperature is 38°C (100.4°F), pulse is 80/min, respirations are 18/min, and blood pressure is 100/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 93%. Diffuse crackles are heard bilaterally. There is no peripheral edema. After she walks 50 feet, her oxygen saturation decreases to 83%. Her leukocyte count is 4800/mm^3 (70% segmented neutrophils, 2% bands, 26% lymphocytes, and 2% eosinophils). An x-ray of the chest shows diffuse alveolar infiltrates bilaterally. Which of the following is the most likely diagnosis?

A) Histoplasmosis
B) Mycoplasmal pneumonia
C) *Pneumocystis jirovecii* (formerly *P. carinii*) pneumonia
D) Right-sided endocarditis with septic emboli to the lungs
E) Sarcoidosis

Correct Answer: C.

Pneumocystis jirovecii (formerly *P. carinii*) is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients. Chest imaging typically shows diffuse, bilateral infiltrates often prominently about the hila. Methenamine silver or toluidine blue stains selectively stain the cyst walls and are used to confirm the diagnosis. *Pneumocystis jirovecii* primarily affects immunosuppressed patients. This patient likely has undiagnosed HIV/AIDS because sharing needles (even if rare) and using unsterilized needles with intravenous drugs increases risk for transmission of HIV. HIV-positive patients with CD4+ T-lymphocyte counts below 200 cells/mm^3 are at risk for developing pneumonia from *Pneumocystis jirovecii*. Treatment consists of trimethoprim-sulfamethoxazole (TMP-SMX), atovaquone, or pentamidine, with TMP-SMX serving as first-line preventive therapy for HIV patients with a CD4+ count <200/mm^3.

Incorrect Answers: A, B, D, and E.

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E) Sarcoidosis

Correct Answer: C.

Pneumocystis jirovecii (formerly *P. carinii*) is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients. Chest imaging typically shows diffuse, bilateral infiltrates often prominently about the hila. Methenamine silver or toluidine blue stains selectively stain the cyst walls and are used to confirm the diagnosis. *Pneumocystis jirovecii* primarily affects immunosuppressed patients. This patient likely has undiagnosed HIV/AIDS because sharing needles (even if rare) and using unsterilized needles with intravenous drugs increases risk for transmission of HIV. HIV-positive patients with CD4+ T-lymphocyte counts below 200 cells/mm^3 are at risk for developing pneumonia from *Pneumocystis jirovecii*. Treatment consists of trimethoprim-sulfamethoxazole (TMP-SMX), atovaquone, or pentamidine, with TMP-SMX serving as first-line preventive therapy for HIV patients with a CD4+ count <200/mm^3.

Incorrect Answers: A, B, D, and E.

Histoplasmosis (Choice A) is an endemic mycosis caused by *Histoplasma capsulatum* that causes pulmonary illness when spores are inhaled from the environment. Pulmonary histoplasmosis can present in acute, subacute, or chronic phases, generally characterized by fevers, malaise, myalgia with associated cough, and hemoptysis with the development of small, calcified nodules and mediastinal or hilar lymphadenopathy. Histoplasmosis is most associated with exposure to bird or bat droppings.

Mycoplasmal pneumonia (Choice B) is a common atypical bacterial cause of community acquired pneumonia in young adults, and presents with acute cough, fever, chills, and shortness of breath. The chest x-ray would typically show multifocal infiltrates.

Endocarditis (Choice D) presents with acute or subacute fever, a new or changing heart murmur, and vascular and immunologic phenomena such as Roth spots, Osler nodes, Janeway lesions, and splinter hemorrhages. Septic emboli to the lungs would typically show as multifocal airspace disease, often with abscesses and air-fluid concentrations, on imaging.

Sarcoidosis (Choice E) is a chronic noncaseating granulomatous disease, most commonly presenting with bilateral hilar lymphadenopathy and possible coarse, upper lobe-predominant reticular pulmonary opacities.

Educational Objective: *Pneumocystis jirovecii* (formerly *P. carinii*) is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients. Chest x-ray typically discloses diffuse, bilateral infiltrates.

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29. A 32-year-old woman, gravida 1, para 1, comes to the physician for a postpartum examination 6 weeks after an uncomplicated vaginal delivery at home. She feels well, and her postpartum course has been uncomplicated. During her pregnancy, results of a serum rubella titer were reported as nonimmune. Physical examination today shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Observation only
B) Second serum rubella titer today
C) Second serum rubella titer when her newborn is vaccinated
D) Rubella vaccine today
E) Rubella vaccine when her newborn is vaccinated

Correct Answer: D.

Rubella infection most commonly presents with a mild, self-limited viral syndrome consisting of a prodromal fever, sore throat, cough, and conjunctivitis, followed several days later by a maculopapular rash. Postauricular and suboccipital lymphadenopathy may also be present. However, when a pregnant patient is infected with rubella, the outcomes for the fetus may be much more serious. Fetal rubella infection causes sensorineural deafness, neurodevelopmental delay, congenital cardiac defects, microcephaly, and extramedullary hematopoiesis. Because the MMR (measles-mumps-rubella) vaccine that provides protection against rubella is a live-attenuated virus, it should not be administered during pregnancy. Thus, it is pertinent to ensure that women of reproductive age are immune to rubella. Because of this patient's nonimmune rubella titer results, she should receive the rubella vaccine as soon as possible.

Incorrect Answers: A, B, C, and E.

Observation only (Choice A) is inappropriate because this patient who is not immune to rubella may again become pregnant, which would make her ineligible for the vaccine. She and her fetus would then be unprotected from the infection, which could potentially lead to increased fetal morbidity.

Second serum rubella titer today (Choice B) or when her newborn is vaccinated (Choice C) would not change management. This patient has no history of a rubella infection, and thus her titer is unlikely to have changed. As this patient is nonimmune, she should be vaccinated as soon as possible to prevent complications with future

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C) Second serum rubella titer when her newborn is vaccinated

D) Rubella vaccine today

E) Rubella vaccine when her newborn is vaccinated

Correct Answer: D.

Rubella infection most commonly presents with a mild, self-limited viral syndrome consisting of a prodromal fever, sore throat, cough, and conjunctivitis, followed several days later by a maculopapular rash. Postauricular and suboccipital lymphadenopathy may also be present. However, when a pregnant patient is infected with rubella, the outcomes for the fetus may be much more serious. Fetal rubella infection causes sensorineural deafness, neurodevelopmental delay, congenital cardiac defects, microcephaly, and extramedullary hematopoiesis. Because the MMR (measles-mumps-rubella) vaccine that provides protection against rubella is a live-attenuated virus, it should not be administered during pregnancy. Thus, it is pertinent to ensure that women of reproductive age are immune to rubella. Because of this patient's nonimmune rubella titer results, she should receive the rubella vaccine as soon as possible.

Incorrect Answers: A, B, C, and E.

Observation only (Choice A) is inappropriate because this patient who is not immune to rubella may again become pregnant, which would make her ineligible for the vaccine. She and her fetus would then be unprotected from the infection, which could potentially lead to increased fetal morbidity.

Second serum rubella titer today (Choice B) or when her newborn is vaccinated (Choice C) would not change management. This patient has no history of a rubella infection, and thus her titer is unlikely to have changed. As this patient is nonimmune, she should be vaccinated as soon as possible to prevent complications with future pregnancies.

Rubella vaccine when her newborn is vaccinated (Choice E) is not correct. Vaccination of the patient should occur as soon as possible to prevent her from again becoming pregnant without immunity to rubella.

Educational Objective: Fetal rubella infection can lead to sensorineural deafness, neurodevelopmental delay, congenital cardiac defects, microcephaly, and extramedullary hematopoiesis. Women of reproductive age who are not immune to rubella should receive the MMR vaccine as soon as possible to prevent these complications. MMR vaccine administration is contraindicated during pregnancy.

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30. A study is conducted to assess the impact of obesity on the risk for cerebral infarction. The investigator enrolls 100 participants with a history of cerebral infarction and 100 healthy participants. The investigator determines each participant's weight. The results show:

		Cerebral Infarction		
		Yes	No	Total
Obesity	Yes	40	30	70
	No	60	70	130
	Total	100	100	200

Which of the following represents the odds ratio for the relationship between obesity and cerebral infarction?

A) 30/60
B) 60/30
C) (30/60)/(70/40)
D) (40/60)/(30/70)
E) (40/100)/(30/100)

Correct Answer: D.

An odds ratio is the ratio of the odds of a risk factor being present in those that develop a particular disease to the odds of it being present in those that do not develop the disease. It is commonly used in case-control studies. It provides a measure of the relationship between an exposure and an outcome. Values less than 1.0 indicate decreased odds of a risk factor being present in those with the disease, whereas values greater than 1.0 indicate increased odds of the risk factor being present in those with the disease. A value of 1.0 indicates no relationship between the two variables. In this particular example, the odds ratio would be used to determine how much more likely a patient with a history of cerebral infarction is to be obese compared to patients without a history of cerebral infarction. The odds of a patient with a history of cerebral infarction being obese is 40/60, whereas the odds of a patient without a history of cerebral infarction being obese is 30/70. The ratio of the two is (40/60)/(30/70).

Incorrect Answers: A, B, C, and E

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Which of the following represents the odds ratio for the relationship between obesity and cerebral infarction?

A) 30/60
B) 60/30
C) (30/60)/(70/40)
D) (40/60)/(30/70)
E) (40/100)/(30/100)

Correct Answer: D.

An odds ratio is the ratio of the odds of a risk factor being present in those that develop a particular disease to the odds of it being present in those that do not develop the disease. It is commonly used in case-control studies. It provides a measure of the relationship between an exposure and an outcome. Values less than 1.0 indicate decreased odds of a risk factor being present in those with the disease, whereas values greater than 1.0 indicate increased odds of the risk factor being present in those with the disease. A value of 1.0 indicates no relationship between the two variables. In this particular example, the odds ratio would be used to determine how much more likely a patient with a history of cerebral infarction is to be obese compared to patients without a history of cerebral infarction. The odds of a patient with a history of cerebral infarction being obese is 40/60, whereas the odds of a patient without a history of cerebral infarction being obese is 30/70. The ratio of the two is (40/60)/(30/70).

Incorrect Answers: A, B, C, and E.

30/60 (Choice A), 60/30 (Choice B), and (30/60)/(70/40) (Choice C) do not represent appropriate equations for any particular statistical measure.

(40/100)/(30/100) (Choice E) would potentially calculate the relative risk, rather than the odds ratio, if the study was conducted as a cohort study and patients were instead enrolled based on their obese or non-obese status. This is contrary to this case-control study where patients were enrolled based on their history of cerebral infarction. Relative risk is the measure of association between an exposure to a particular factor and the risk for a certain outcome.

Educational Objective: An odds ratio is the ratio of the odds of a risk factor being present in those that develop a particular disease to the odds of it being present in those that do not develop the disease. It is commonly used in case-control studies.

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31. A previously healthy 3-month-old boy is brought to the physician because of a 24-hour history of increasingly rapid breathing, difficulty feeding, and progressive fussiness. He has not had fever, but he has received acetaminophen to ease his fussiness. He receives no other medications. He is exclusively breast-fed. He is alert and pale and appears anxious. His pulse is 250/min, respirations are 68/min, and blood pressure is 80/50 mm Hg. He is not using accessory muscles of respiration. Pulse oximetry on room air shows an oxygen saturation of 99%. Capillary refill time is 2 seconds. Examination shows pink lips and moist oral mucosa. The lungs are clear to auscultation. No murmurs or gallops are heard on cardiac examination. The precordium is hyperdynamic. The abdomen is soft. The liver edge is palpated 3 cm below the right costal margin, and the spleen tip is palpated 2 cm below the left costal margin. Distal pulses are palpable. Laboratory studies show:

Hemoglobin	9 g/dL
Hematocrit	27%
Leukocyte count	8000/mm^3
Platelet count	212,000/mm^3

An ECG is shown. Which of the following is the most likely diagnosis?

A) Atrial flutter
B) Congenital hemolytic anemia
C) Iron deficiency
D) Myocarditis
E) Pericarditis

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Leukocyte count	8000/mm^3
Platelet count	212,000/mm^3

An ECG is shown. Which of the following is the most likely diagnosis?

A) Atrial flutter
B) Congenital hemolytic anemia
C) Iron deficiency
D) Myocarditis
E) Pericarditis
F) Prolonged QT syndrome
G) Supraventricular tachycardia

Correct Answer: G.

Supraventricular tachycardia (SVT) refers to an abnormally rapid pulse and rhythm originating from above the ventricles, typically with a regular rhythm, absence of P waves, and a narrow QRS complex on ECG. Patients with SVT can have acute symptoms of lightheadedness, palpitations, diaphoresis, and syncope. In infants, signs and symptoms can include pallor, irritability, poor feeding, and cyanosis. Infants who present with SVT typically have a pulse between 220 and 280/min. SVT may be caused by structural defects in the His-Purkinje system (eg, in Wolff-Parkinson-White syndrome), may be idiopathic, may be caused by inherent conduction differences in fast and slow AV nodal pathways, or may be provoked by alcohol, nicotine, caffeine, or psychological stress. In patients who are hemodynamically unstable, cardioversion is indicated in the management of SVT. For patients who are hemodynamically stable, attempts can be made to terminate the tachyarrhythmia by vagal maneuvers (eg, ice or cold water over the face) or with adenosine.

Incorrect Answers: A, B, C, D, E, and F.

Atrial flutter (Choice A) can occur with a rapid ventricular rate but presents with typically irregular tachycardia (or with a regular ratio of atrial to ventricular complexes), not regular tachycardia without P waves, as in this case. Atrial flutter also occurs more often in patients with structural heart disease, and supraventricular tachycardia is more

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slow AV nodal pathways, or may be provoked by alcohol, nicotine, caffeine, or psychological stress. In patients who are hemodynamically unstable, cardioversion is indicated in the management of SVT. For patients who are hemodynamically stable, attempts can be made to terminate the tachyarrhythmia by vagal maneuvers (eg, ice or cold water over the face) or with adenosine.

Incorrect Answers: A, B, C, D, E, and F.

Atrial flutter (Choice A) can occur with a rapid ventricular rate but presents with typically irregular tachycardia (or with a regular ratio of atrial to ventricular complexes), not regular tachycardia without P waves, as in this case. Atrial flutter also occurs more often in patients with structural heart disease, and supraventricular tachycardia is more likely in a previously healthy patient with regular tachycardia.

Congenital hemolytic anemia (Choice B) such as with hereditary spherocytosis can present with signs and symptoms including jaundice, splenomegaly, and anemia. This patient's spleen is a normal size, making congenital hemolytic anemia unlikely.

Iron deficiency (Choice C) is common in breast-fed infants and exclusively breast-fed infants should receive iron supplementation starting at 4 months of age. It would not be a cause of supraventricular tachycardia in an infant 3 months of age.

Myocarditis (Choice D) can be result from infection with coxsackievirus B, parvovirus B19, human herpesvirus-6 (HHV-6,) adenovirus, and HIV among other causes. Patients typically present with fever and signs and symptoms characteristic of heart failure, including volume overload, shortness of breath, pulmonary edema, crackles auscultated in the lungs, and an S_3 gallop on physical examination.

Pericarditis (Choice E) can result from infectious and non-infectious causes, including viral infection. Inflammation of the pericardium typically presents with chest pain, and a friction rub may be appreciated on cardiac auscultation. Pericarditis can cause pericardial effusion; if severe or rapid in accumulation, cardiac tamponade may result.

Prolonged QT syndrome (Choice F) is a disorder of prolonged ventricular depolarization and repolarization. It appears on ECG with a prolonged QT interval. It can be complicated by polymorphic ventricular tachycardia or Torsades de pointes.

Educational Objective: Supraventricular tachycardia refers to an abnormally rapid pulse and rhythm originating from above the ventricles, typically with a narrow QRS complex on ECG.

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32. A 17-year-old boy is brought to the emergency department 30 minutes after he was thrown through a window during an altercation. He has no history of serious illness and takes no medications. He is alert and fully oriented. He reports moderate pain in his right arm and hand. His pulse is 110/min, respirations are 22/min, and blood pressure is 110/70 mm Hg. Pulse oximetry on 2 L/min of oxygen by nasal cannula shows an oxygen saturation of 98%. Examination shows superficial abrasions over the right side of the face. A 4 × 4-cm glass shard protrudes from the right upper extremity 2 cm proximal to the medial epicondyle; the extremity is cool and pale, and radial and ulnar pulses are not palpable. Which of the following is the most appropriate next step in management?

A) Angiography of the right upper extremity
B) Duplex ultrasonography of the right upper extremity
C) Immediate removal of the foreign body in the emergency department
D) MR arteriography of the right upper extremity
E) Operative wound exploration

Correct Answer: E.

After a penetrating injury to an extremity, evaluation of bones and joints, soft tissue, vasculature, and peripheral nerves should be performed. Vascular assessment involves evaluation of skin color, temperature, capillary refill, and pulse. In a patient with an obvious vascular injury such as with asymmetry or absence of distal pulses, emergent exploration and management in the operating room is necessary. Vascular injuries can be more subtle, such as with differences in systolic blood pressure between upper extremities in patients with joint dislocations or fractures. In these cases of suspected vascular injury, vascular imaging such as with CT angiography can aid diagnosis. However in cases of clear injury, operative exploration and repair should not be delayed.

Incorrect Answers: A, B, C, and D.

Angiography (Choice A), duplex ultrasonography (Choice B), and MR arteriography (Choice D) are all diagnostic modalities that can aid in the diagnosis of arterial injury. However, this patient's clinical presentation is highly concerning for a severe arterial injury which should be emergently explored in the OR. Waiting for further diagnostic imaging would be inappropriate.

Immediate removal of the foreign body in the department (Choice C) would be inappropriate. The foreign body may be aiding with temporary [illegible]

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B) Duplex ultrasonography of the right upper extremity
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Incorrect Answers: A, B, C, and D.

Angiography (Choice A), duplex ultrasonography (Choice B), and MR arteriography (Choice D) are all diagnostic modalities that can aid in the diagnosis of arterial injury. However, this patient's clinical presentation is highly concerning for a severe arterial injury which should be emergently explored in the OR. Waiting for further diagnostic imaging would be inappropriate.

Immediate removal of the foreign body in the department (Choice C) would be inappropriate. The foreign body may be aiding with tamponade of the artery and removing the foreign body may cause the patient to have severe arterial bleeding. Additionally, the removal of jagged or sharp objects may cause secondary trauma that could be avoided under careful operative guidance.

Educational Objective: In patients with an obvious arterial injury (such as with asymmetric or absent pulses, cool skin, or a pale extremity), emergent exploration and management in the operating room is necessary.

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33. A 58-year-old woman with osteoarthritis comes to the office because of a 1-week history of fatigue. She also has had difficulty at work climbing stairs and putting away office supplies in cabinets above shoulder level. She says that during this time her arthritis pain has worsened and has spread to her shoulders, hips, and upper legs. She attributes her fatigue to poor sleep because of aching of her arms and legs. During a routine examination 6 months ago, hypertension and hypercholesterolemia were diagnosed and she was started on chlorthalidone, simvastatin, aspirin, vitamin D, calcium, and a multivitamin. Her only additional medication is ibuprofen. The patient smoked two packs of cigarettes daily for 30 years but quit 6 months ago in an attempt to improve her health after her sister had "a major heart attack." At that time, the patient also stopped drinking alcoholic beverages and decreased her coffee consumption from 4 cups to 2 cups daily. She is 168 cm (5 ft 6 in) tall and weighs 73 kg (160 lb); BMI is 26 kg/m^2. Vital signs are temperature 36.4°C (97.6°F), pulse 84/min, respirations 16/min, and blood pressure 122/78 mm Hg. The patient appears anxious but is not in acute distress. Musculoskeletal examination shows no edema, erythema, or deformity with minimal tenderness of all major joints. Active and passive range of motion is full. During passive range of motion testing, the patient reports pain where her upper arms and upper legs are grasped. The remainder of the physical examination discloses no abnormalities. Which of the following studies is most likely to establish the diagnosis?

A) Determination of erythrocyte sedimentation rate
B) Measurement of serum creatine kinase activity
C) Muscle biopsy
D) Nerve conduction studies
E) Serum rheumatoid factor assay

Correct Answer: B.

This patient is exhibiting signs and symptoms of a myopathy, with proximal muscle weakness and muscle tenderness to palpation. In contrast, arthritis affects joints and presents with arthralgias, tenderness to joints, and pain with passive and/or active range of motion. Creatine kinase is an intracellular molecule released by myocytes when damaged. Increased creatine kinase concentration can be seen in traumatic injuries (eg, rhabdomyolysis) and myopathies. Myopathy commonly results from autoimmune disease, genetic disease, or as an adverse effect of medication. This patient's myopathy is likely secondary to a statin-induced myopathy because she started the medication 6 months ago. Statin-associated myopathy if severe, can progress to rhabdomyolysis. Statins also may cause liver injury and increased serum liver enzymes. Treatment includes dose reduction or use of alternate lipid-lowering therapies.

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E) Serum rheumatoid factor assay

Correct Answer: B.

This patient is exhibiting signs and symptoms of a myopathy, with proximal muscle weakness and muscle tenderness to palpation. In contrast, arthritis affects joints and presents with arthralgias, tenderness to joints, and pain with passive and/or active range of motion. Creatine kinase is an intracellular molecule released by myocytes when damaged. Increased creatine kinase concentration can be seen in traumatic injuries (eg, rhabdomyolysis) and myopathies. Myopathy commonly results from autoimmune disease, genetic disease, or as an adverse effect of medication. This patient's myopathy is likely secondary to a statin-induced myopathy because she started the medication 6 months ago. Statin-associated myopathy if severe, can progress to rhabdomyolysis. Statins also may cause liver injury and increased serum liver enzymes. Treatment includes dose reduction or use of alternate lipid-lowering therapies.

Incorrect Answers: A, C, D, and E.

Erythrocyte sedimentation rate (Choice A) is a sensitive, but non-specific, marker of inflammation that can be increased in some inflammatory diseases such as rheumatoid arthritis or dermatomyositis. Dermatomyositis is an autoimmune connective tissue disease affecting the skin and the proximal muscles, which can also cause muscle pain and weakness, but would also present with cutaneous manifestations.

Muscle biopsy (Choice C) is an invasive test that can aid in the diagnosis of genetic myopathies such as Duchenne muscular dystrophy and mitochondrial myopathy. This patient's myopathy is likely secondary to statin exposure, and a biopsy would be unnecessary at this time.

Nerve conduction studies (Choice D) are used to differentiate myopathic and neuropathic causes of extremity weakness. They would be used in the diagnosis of demyelinating diseases, which may show decreased conduction velocities and prolonged distal motor latencies.

Serum rheumatoid factor assay (Choice E) is used in the diagnosis of rheumatoid arthritis, an autoimmune inflammatory arthropathy that results in symmetric involvement of multiple joints, most commonly the metacarpophalangeal and proximal interphalangeal joints of the hands. Ulnar deviation of the fingers and boutonniere and swan neck deformities commonly occur. This patient's joints are nontender and have full range of motion, making rheumatoid arthritis unlikely.

Educational Objective: Statin-associated myopathy presents with proximal muscle weakness and muscle tenderness to palpation. Treatment includes dose reduction or use of alternate lipid-lowering therapies.

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34. A 37-year-old man is brought to the emergency department after his motorcycle ran into the back of a truck at high speed. He was wearing a helmet. On arrival, his neck is immobilized in a cervical collar, and intravenous fluids are being administered. Paramedics report that at the scene he appeared to be intoxicated. He is alert and talking. His breath smells of alcohol. His pulse is 130/min, respirations are 30/min, and blood pressure is 100/60 mm Hg. The lungs are clear to auscultation. Heart sounds are normal. The abdomen is distended and tender. There is blood at the urethral meatus. Ultrasonography shows blood in the abdomen. An x-ray of the pelvis shows fractures of the pubic rami and ischial and ilial fractures on the right. Which of the following is the most appropriate next step in management?

A) Cystography
B) Intravenous pyelography
C) Retrograde urethrography
D) Placement of a urinary catheter
E) Diagnostic peritoneal lavage

Correct Answer: C.

A patient with pelvic injury and blood at the urethral meatus raises suspicion for a urethral injury. Urethral injuries are characterized by difficulty voiding, blood at the urethral meatus, and perineal ecchymosis and may be associated with a pelvic fracture. Straddle injuries can cause trauma to the anterior urethra, while pelvic fractures may injure the posterior urethra. Urethral injuries are evaluated by a retrograde urethrogram, which involves the injection of contrast into the urethra to evaluate for the extravasation of contrast, indicating urethral discontinuity. Depending on the location and severity of urethral injury, patients may require surgical repair or the placement of a urethral catheter to help promote healing and prevent complications of urinary extravasation, infection, urethrocutaneous fistula, or urethral stricture.

Incorrect Answers: A, B, D, and E.

Cystography (Choice A) is indicated for evaluation of the urinary bladder when a bladder injury is suspected. This allows for characterization of an intraperitoneal versus extraperitoneal bladder rupture but would be inappropriate in suspected urethral injury.

Intravenous pyelography (Choice B) involves the intravenous injection of radiopaque contrast to subsequently visualize the kidney collecting system, ureters, and bladder

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D) Placement of a urinary catheter

E) Diagnostic peritoneal lavage

Correct Answer: C.

A patient with pelvic injury and blood at the urethral meatus raises suspicion for a urethral injury. Urethral injuries are characterized by difficulty voiding, blood at the urethral meatus, and perineal ecchymosis and may be associated with a pelvic fracture. Straddle injuries can cause trauma to the anterior urethra, while pelvic fractures may injure the posterior urethra. Urethral injuries are evaluated by a retrograde urethrogram, which involves the injection of contrast into the urethra to evaluate for the extravasation of contrast, indicating urethral discontinuity. Depending on the location and severity of urethral injury, patients may require surgical repair or the placement of a urethral catheter to help promote healing and prevent complications of urinary extravasation, infection, urethrocutaneous fistula, or urethral stricture.

Incorrect Answers: A, B, D, and E.

Cystography (Choice A) is indicated for evaluation of the urinary bladder when a bladder injury is suspected. This allows for characterization of an intraperitoneal versus extraperitoneal bladder rupture but would be inappropriate in suspected urethral injury.

Intravenous pyelography (Choice B) involves the intravenous injection of radiopaque contrast to subsequently visualize the kidney collecting system, ureters, and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures.

Placement of a urinary catheter (Choice D) would be contraindicated as the first step in management in a patient with blood at the urethral meatus, portending a likely urethral injury. It may cause further trauma and injury to the urethra and internal pelvic structures without the injury first being delineated on retrograde urethrography.

Diagnostic peritoneal lavage (Choice E) involves aspiration of peritoneal contents, infusing sterile saline into the peritoneal cavity, and analyzing the effluent. If blood, food particles, bile, bilirubin, amylase, or alkaline phosphatase are found, exploratory laparotomy is indicated as the presence of these findings suggests hollow or solid viscus injury. Peritoneal lavage has no role in evaluating urethral injury.

Educational Objective: Urethral injuries can occur from straddle injuries (anterior urethra) or pelvic fractures (posterior urethra). Retrograde urethrography permits evaluation of the urethra as a source of hematuria.

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35. A 25-year-old woman comes to the emergency department because of nausea, diarrhea, and anxiety for 2 days. She also has noticed dizziness and tingling sensations shooting down her forearms. Her sleep and appetite have been normal. She has a 3-year history of social phobia well controlled for the past year with paroxetine. She is attending an out-of-town conference and forgot to pack her medication; her last dose was 3 days ago. She does not drink alcohol or use illicit drugs. She is 163 cm (5 ft 4 in) tall and weighs 80 kg (176 lb); BMI is 30 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 80/min, and blood pressure is 110/75 mm Hg. Physical examination shows no other abnormalities. Mental status examination shows an irritable mood with a full range of affect. Her speech is of normal rate and rhythm. There is no evidence of suicidal ideation or hallucinations. She can recall three of three objects after 5 minutes. Long-term memory is intact. Serum studies show no traces of paroxetine. Which of the following is the most appropriate next step in management?

A) Begin behavioral therapy
B) Begin alprazolam therapy
C) Begin bupropion therapy
D) Begin clomipramine therapy
E) Begin gabapentin therapy
F) Resume paroxetine therapy

Correct Answer: F.

This patient's acutely increased anxiety and physical symptoms correlate in timing with her paroxetine discontinuation. Paroxetine is a selective serotonin reuptake inhibitor utilized to treat anxiety and depressive disorders. The abrupt discontinuation of serotonergic medication may lead to an antidepressant discontinuation syndrome within a few days. The relatively short half-life of paroxetine (about 20 hours) increases the risk for discontinuation syndrome. Patients typically experience flu-like symptoms (eg, chills, myalgias, fatigue, rhinorrhea, headache, nausea, diarrhea) along with dizziness, paresthesia, anxiety, and irritability. Symptoms are commonly self-limited, though resuming the previous dose of medication is indicated for moderate to severe symptoms. This patient should resume her regular paroxetine dose to treat the discontinuation syndrome and continue addressing her social anxiety disorder.

Incorrect Answers: A, B, C, D, and E.

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F) Resume paroxetine therapy

Correct Answer: F.

This patient's acutely increased anxiety and physical symptoms correlate in timing with her paroxetine discontinuation. Paroxetine is a selective serotonin reuptake inhibitor utilized to treat anxiety and depressive disorders. The abrupt discontinuation of serotonergic medication may lead to an antidepressant discontinuation syndrome within a few days. The relatively short half-life of paroxetine (about 20 hours) increases the risk for discontinuation syndrome. Patients typically experience flu-like symptoms (eg, chills, myalgias, fatigue, rhinorrhea, headache, nausea, diarrhea) along with dizziness, paresthesia, anxiety, and irritability. Symptoms are commonly self-limited, though resuming the previous dose of medication is indicated for moderate to severe symptoms. This patient should resume her regular paroxetine dose to treat the discontinuation syndrome and continue addressing her social anxiety disorder.

Incorrect Answers: A, B, C, D, and E.

Beginning behavioral therapy (Choice A) may be helpful in treating social anxiety disorder. This patient's acutely increased anxiety correlates in timing with her paroxetine discontinuation and is accompanied by flu-like and neurologic symptoms, consistent with an antidepressant discontinuation syndrome rather than an exacerbation of social anxiety disorder.

Beginning alprazolam therapy (Choice B), a benzodiazepine medication, is likely to assist with acute anxiety but would not address this patient's physical symptoms. This patient's acute anxiety along with flu-like and neurologic symptoms are instead consistent with antidepressant continuation syndrome.

Beginning bupropion therapy (Choice C), an antidepressant medication that commonly increases anxiety as a adverse effect, would be unlikely to reduce this patient's anxiety or address her flu-like or neurologic symptoms.

Beginning clomipramine therapy (Choice D), a tricyclic antidepressant, or gabapentin therapy (Choice E), an anticonvulsant, are sometimes utilized in refractory social anxiety disorder. This patient's acutely increased anxiety correlates in timing with her paroxetine discontinuation and is accompanied by flu-like and neurologic symptoms, consistent with an antidepressant discontinuation syndrome rather than an exacerbation of social anxiety disorder.

Educational Objective: The abrupt discontinuation of serotonergic medication may lead to an antidepressant discontinuation syndrome within a few days. Patients typically experience flu-like symptoms (eg, chills, myalgias, fatigue, rhinorrhea, headache, nausea, diarrhea) along with dizziness, paresthesia, anxiety, and irritability.

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36. A 72-year-old man with lung cancer comes to the physician because of a 2-month history of weakness in his legs. He also has had dry mouth, constipation, and tingling of his hands and feet during this period. He received radiation therapy 3 weeks ago and is currently undergoing chemotherapy. He has smoked two packs of cigarettes daily for 50 years. His temperature is 37°C (98.6°F), pulse is 86/min, respirations are 20/min, and blood pressure is 126/84 mm Hg. There is mild bilateral ptosis, which does not worsen after upward gaze for 1 minute. Ocular movements are full. Oral mucosa is dry. There is mild weakness of hip flexion bilaterally. After several attempts, he can rise from a chair with his arms folded across his chest. Deep tendon reflexes are absent. Sensation is intact. Which of the following is most likely to confirm the diagnosis?

A) X-rays of the lumbosacral spine
B) Bone scan
C) CT scan of the pelvis
D) Quadriceps muscle biopsy
E) Repetitive nerve stimulation

Correct Answer: E.

Lambert-Eaton myasthenic syndrome (LEMS) is an uncommon neurologic condition that affects neuromuscular junction transmission. Patients with LEMS possess antibodies to voltage-gated calcium channels on presynaptic lower motoneurons, which decreases calcium influx and acetylcholine release to postsynaptic skeletal muscle cells. This patient's lung cancer likely produces paraneoplastic autoantibodies against these voltage-gated calcium channels, causing LEMS. Patients consequently demonstrate progressive proximal muscle weakness with depressed or absent deep tendon reflexes. The muscle weakness typically improves with exercise as small amounts of acetylcholine accumulate in the synaptic cleft over time, increasing the frequency of postsynaptic action potentials in skeletal muscle cells. Autonomic symptoms such as decreased salivation (and consequent dry mouth) and constipation may also occur, and mild cranial nerve involvement (eg, ptosis) may be disclosed. The diagnosis may be confirmed with nerve conduction studies and electromyography with repetitive nerve stimulation and exercise testing. Management involves treatment of the underlying malignancy and, in patients with impairing weakness, medications that increase synaptic acetylcholine (eg, pyridostigmine).

Incorrect Answers: A, B, C, and D.

X-rays of the lumbosacral spine (Choice A) and bone scans (Choice B) could assist in detecting bony metastases of this patient's lung cancer, which could lead to spinal

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D) Quadriceps muscle biopsy

E) Repetitive nerve stimulation

Correct Answer: E.

Lambert-Eaton myasthenic syndrome (LEMS) is an uncommon neurologic condition that affects neuromuscular junction transmission. Patients with LEMS possess antibodies to voltage-gated calcium channels on presynaptic lower motoneurons, which decreases calcium influx and acetylcholine release to postsynaptic skeletal muscle cells. This patient's lung cancer likely produces paraneoplastic autoantibodies against these voltage-gated calcium channels, causing LEMS. Patients consequently demonstrate progressive proximal muscle weakness with depressed or absent deep tendon reflexes. The muscle weakness typically improves with exercise as small amounts of acetylcholine accumulate in the synaptic cleft over time, increasing the frequency of postsynaptic action potentials in skeletal muscle cells. Autonomic symptoms such as decreased salivation (and consequent dry mouth) and constipation may also occur, and mild cranial nerve involvement (eg, ptosis) may be disclosed. The diagnosis may be confirmed with nerve conduction studies and electromyography with repetitive nerve stimulation and exercise testing. Management involves treatment of the underlying malignancy and, in patients with impairing weakness, medications that increase synaptic acetylcholine (eg, pyridostigmine).

Incorrect Answers: A, B, C, and D.

X-rays of the lumbosacral spine (Choice A) and bone scans (Choice B) could assist in detecting bony metastases of this patient's lung cancer, which could lead to spinal cord compression. However, back pain would likely be present. Additionally, MRI of the spine would be a more sensitive imaging modality to detect spinal cord compression.

CT scan of the pelvis (Choice C) assists in diagnosing cancers of the colon, rectum, bladder, and other pelvic viscera. Lower extremity weakness would be atypical in patients with these cancers.

Quadriceps muscle biopsy (Choice D) assists in diagnosing polymyositis. Polymyositis is an inflammatory myopathy that typically presents with proximal muscle pain and weakness. Autonomic dysfunction and cranial nerve involvement would be atypical, and this patient instead discloses painless muscle weakness.

Educational Objective: Patients with Lambert-Eaton myasthenic syndrome possess antibodies to voltage-gated calcium channels on presynaptic lower motoneurons, which decrease calcium influx and acetylcholine release to postsynaptic skeletal muscle cells. In some patients, tumors are associated with these antibodies, resulting in paraneoplastic LEMS. Patients present with progressive proximal muscle weakness that improves with exercise.

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37. A 37-year-old man with end-stage Duchenne muscular dystrophy is scheduled for discharge from the hospital after treatment for pneumonia. He has been admitted to the hospital four times over the past 6 months for recurrent pneumonia. Over the past 3 years, he has received mechanical ventilation and has used a wheelchair. His life expectancy is less than 6 months. The patient tells the physician that he is "tired of living like this" and requests a do-not-resuscitate order with no further antibiotics. He has been considering this decision for 3 weeks but has not discussed it with his family. On mental status examination, he shows sadness about his health but has a normal thought process. He expresses no ambivalence about his decision. Which of the following is the most appropriate next step in management?

A) Contact the hospital ethics committee
B) Determine if the patient wants to discuss his decision with anyone else
C) Schedule a meeting with the patient and his family
D) Transfer the patient to a skilled nursing care facility
E) Obtain psychiatric assessment

Correct Answer: B.

According to the ethical principle of autonomy, patients who possess decisional capacity are permitted to decide against prolonging their life. This patient appears able to appreciate and reason through the relevant information and is therefore legally and ethically permitted to make the decision without input from others. However, social contacts such as friends and family commonly help patients make end-of-life decisions and may provide physical, emotional, and/or spiritual support during the dying process. Therefore, the physician should ask this patient whether he would like to discuss his decision with anyone in his life.

Incorrect Answers: A, C, D, and E.

Contacting the hospital ethics committee (Choice A) may be appropriate in cases when patients without decisional capacity or surrogate decision-makers decline recommended medical treatment. However, this patient possesses decisional capacity.

Scheduling a meeting with the patient and his family (Choice C) would be a paternalistic approach that would violate the patient's autonomy. The physician should first ask

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C) Schedule a meeting with the patient and his family

D) Transfer the patient to a skilled nursing care facility

E) Obtain psychiatric assessment

Correct Answer: B.

According to the ethical principle of autonomy, patients who possess decisional capacity are permitted to decide against prolonging their life. This patient appears able to appreciate and reason through the relevant information and is therefore legally and ethically permitted to make the decision without input from others. However, social contacts such as friends and family commonly help patients make end-of-life decisions and may provide physical, emotional, and/or spiritual support during the dying process. Therefore, the physician should ask this patient whether he would like to discuss his decision with anyone in his life.

Incorrect Answers: A, C, D, and E.

Contacting the hospital ethics committee (Choice A) may be appropriate in cases when patients without decisional capacity or surrogate decision-makers decline recommended medical treatment. However, this patient possesses decisional capacity.

Scheduling a meeting with the patient and his family (Choice C) would be a paternalistic approach that would violate the patient's autonomy. The physician should first ask whether the patient has social contacts with whom he would like to discuss his decision.

Transferring the patient to a skilled nursing care facility (Choice D) may be appropriate if the patient verbalizes a preference for dying in a nursing facility. However, the physician should first ask about the patient's preferences for end-of-life decision making and care.

Obtaining a psychiatric assessment (Choice E) would be unnecessary in this patient who does not demonstrate mood or thought disturbances other than the normal emotional reaction of sadness. A psychiatric assessment may be appropriate if the patient does not demonstrate decisional capacity and the physician suspects that a psychiatric illness such as depression or schizophrenia is interfering with decisional capacity.

Educational Objective: Though patients with decisional capacity are legally and ethically permitted to make their own end-of-life decisions, social support can help patients talk through decisions and fulfill end-of-life emotional needs.

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38. A 12-year-old boy is brought to the physician for a routine follow-up examination. He received the diagnosis of chronic renal failure secondary to glomerulonephritis 2 years ago. He has hypertension controlled with an ACE inhibitor. He is at the 10th percentile for height and weight. Examination shows mild edema of the lower extremities. His mother asks about ways to minimize complications of his renal failure. Which of the following is the most appropriate recommendation?

A) Increase his intake of fluids
B) Increase his intake of potassium
C) Restrict his intake of calories
D) Restrict his intake of phosphorus
E) Begin monthly injections of vitamin B_{12} (cobalamin)

Correct Answer: D.

Chronic renal failure can develop because of a variety of mechanisms, such as genetic factors, infection, autoimmune disease, and as a sequela of other diseases, such as hypertension or diabetes mellitus. General management includes blood pressure control, restriction of fluids and protein, smoking cessation, bicarbonate supplementation for chronic metabolic acidosis, and the treatment of contributing diseases. Chronic renal failure can be complicated by hyperkalemia, volume overload, metabolic acidosis, hyperphosphatemia, hyperparathyroidism with subsequent changes in bone structure (such as renal osteodystrophy), and anemia. Hyperphosphatemia can lead to secondary hyperparathyroidism because the injured kidney is unable to appropriately secrete phosphate, causing the parathyroid to increase its hormone production. Hyperphosphatemia is also associated with increased vascular calcifications, specifically of the coronary arteries. Therefore, restricting this patient's intake of phosphorus would be appropriate. Phosphate binders may also be added.

Incorrect Answers: A, B, C, and E.

Increasing his intake of fluids (Choice A) would be inappropriate and may lead to complications. Chronic renal failure patients are at an increased risk for volume overload given the inability of their kidneys to properly secrete fluids.

Increasing his intake of potassium (Choice B) would also be inappropriate because chronic renal failure patients are at an increased risk for developing hyperkalemia. This

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E) Begin monthly injections of vitamin B_{12} (cobalamin)

Correct Answer: D.

Chronic renal failure can develop because of a variety of mechanisms, such as genetic factors, infection, autoimmune disease, and as a sequela of other diseases, such as hypertension or diabetes mellitus. General management includes blood pressure control, restriction of fluids and protein, smoking cessation, bicarbonate supplementation for chronic metabolic acidosis, and the treatment of contributing diseases. Chronic renal failure can be complicated by hyperkalemia, volume overload, metabolic acidosis, hyperphosphatemia, hyperparathyroidism with subsequent changes in bone structure (such as renal osteodystrophy), and anemia. Hyperphosphatemia can lead to secondary hyperparathyroidism because the injured kidney is unable to appropriately secrete phosphate, causing the parathyroid to increase its hormone production. Hyperphosphatemia is also associated with increased vascular calcifications, specifically of the coronary arteries. Therefore, restricting this patient's intake of phosphorus would be appropriate. Phosphate binders may also be added.

Incorrect Answers: A, B, C, and E.

Increasing his intake of fluids (Choice A) would be inappropriate and may lead to complications. Chronic renal failure patients are at an increased risk for volume overload given the inability of their kidneys to properly secrete fluids.

Increasing his intake of potassium (Choice B) would also be inappropriate because chronic renal failure patients are at an increased risk for developing hyperkalemia. This is caused by the inability of the damaged renal system to secrete potassium. This patient should limit his potassium intake.

Restricting his intake of calories (Choice C) is incorrect. Despite this patient having chronic renal disease, he is 12 years old and still growing and developing. Caloric restriction may lead to growth disturbances without improvement in his renal function.

Beginning monthly injections of vitamin B_{12} (cobalamin) (Choice E) is not necessary. While patients with chronic renal failure are at an increased risk for anemia, this is caused by inadequate erythropoietin production and anemia of chronic disease rather than a megaloblastic macrocytic anemia. These patients are not typically at an increased risk for vitamin B_{12} deficiency.

Educational Objective: Patients with chronic renal failure are prone to volume overload, hyperkalemia, hyperphosphatemia, metabolic acidosis, hyperparathyroidism, osteodystrophy, and anemia. These patients should minimize their intake of fluids, potassium, and phosphate.

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39. A 72-year-old woman with a 30-year history of type 2 diabetes mellitus comes to the physician because of pain and swelling of her left foot since a blister on the bottom of her left foot broke 2 weeks ago. Her temperature is 37.2°C (99°F). Examination shows swelling and erythema of the left distal leg, ankle, and foot; there is a 2-cm ulcer at the base of the heel with an overlying black eschar. Peripheral pulses are decreased bilaterally. Capillary refill time is greater than 3 seconds. The ulcer is debrided, and a sterile probe is inserted until the base touches bone. Which of the following is the most likely cause of these findings?

A) Mixed aerobic and anaerobic organisms
B) Mixed anaerobic organisms
C) *Pseudomonas aeruginosa*
D) *Staphylococcus aureus*
E) *Staphylococcus epidermidis*

Correct Answer: A.

Infection with mixed aerobic and anaerobic organisms is the most likely cause of this patient's non-healing foot ulcer and likely osteomyelitis. The patient has poorly controlled type 2 diabetes mellitus and is presenting with signs of osteomyelitis including pain, swelling, erythema, and an ulcer on the foot which probes to bone. A combination of factors leads to increased risk for foot infections in diabetic patients. These include immune compromise inherent to diabetes, decreased sensation in the feet allowing deep wounds to go undetected by patients, decreased motor function leading to altered pressure points and swelling of the lower extremities, and decreased autonomic nervous system function leading to impaired sweat regulation and increased risk for dryness, cracking, and fissuring on the feet causing portals for bacterial entry. Occasionally, a single organism is identified but ulcers are typically polymicrobial, especially if they are deep, chronically infected, or previously treated with antibiotics. Osteomyelitis typically occurs by direct extension of soft tissue infection and can be screened for clinically by determining if the ulcer probes to bone. When a diabetic foot ulcer is present, x-ray of the foot should be performed to help to evaluate for the presence of osteomyelitis which could require surgical management in addition to medical management.

Incorrect Answers: B, C, D, and E.

Mixed anaerobic organisms (Choice B) are typically accompanied by aerobic organisms in diabetic foot ulcers. Deep soft tissue infections like necrotizing fasciitis or gas

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Infection with mixed aerobic and anaerobic organisms is the most likely cause of this patient's non-healing foot ulcer and likely osteomyelitis. The patient has poorly controlled type 2 diabetes mellitus and is presenting with signs of osteomyelitis including pain, swelling, erythema, and an ulcer on the foot which probes to bone. A combination of factors leads to increased risk for foot infections in diabetic patients. These include immune compromise inherent to diabetes, decreased sensation in the feet allowing deep wounds to go undetected by patients, decreased motor function leading to altered pressure points and swelling of the lower extremities, and decreased autonomic nervous system function leading to impaired sweat regulation and increased risk for dryness, cracking, and fissuring on the feet causing portals for bacterial entry. Occasionally, a single organism is identified but ulcers are typically polymicrobial, especially if they are deep, chronically infected, or previously treated with antibiotics. Osteomyelitis typically occurs by direct extension of soft tissue infection and can be screened for clinically by determining if the ulcer probes to bone. When a diabetic foot ulcer is present, x-ray of the foot should be performed to help to evaluate for the presence of osteomyelitis which could require surgical management in addition to medical management.

Incorrect Answers: B, C, D, and E.

Mixed anaerobic organisms (Choice B) are typically accompanied by aerobic organisms in diabetic foot ulcers. Deep soft tissue infections like necrotizing fasciitis or gas gangrene are likely to demonstrate anaerobic organisms.

Pseudomonas aeruginosa (Choice C) may be the cause of osteomyelitis following a puncture wound to the foot, particularly if there has also been exposure to water or moist environments.

Staphylococcus aureus (Choice D) is a common cause of many superficial cutaneous infections including impetigo, folliculitis, cellulitis, erysipelas, furuncles, or carbuncles. In the case of a diabetic foot ulcer, a polymicrobial cause is much more likely.

Staphylococcus epidermidis (Choice E) is a component of normal skin flora. If identified on culture of a cutaneous wound, it is most likely a contaminant. However, it is an increasingly common cause of bacteremia and endocarditis. It is especially seen in the context of prosthetic devices because of its ability to create adherent biofilms which are difficult to treat.

Educational Objective: Diabetic patients are at an increased risk for soft tissue infections on the feet because of decreased immune status and neuropathy of sensory, motor, and autonomic nerves. Deep ulcers that have exposed bone or probe to bone may be complicated by osteomyelitis or gas gangrene. Mixed aerobic and anaerobic bacteria are usually the cause of the infection.

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40. A 13-year-old girl is brought to the physician because her mother is concerned that her daughter has never had a menstrual period. She is at the 80th percentile for height and 75th percentile for weight. Breast and pubic hair development is Tanner stage 2. Examination shows no other abnormalities. Which of the following is the most appropriate next step in management?

A) Reexamination in 1 year
B) Pelvic examination
C) Karyotype analysis
D) Measurement of serum estradiol concentration
E) Transvaginal ultrasonography

Correct Answer: A.

Primary amenorrhea is described as the absence of menarche at 15 years of age with appropriate secondary sexual characteristics or at 13 years of age without secondary sexual characteristics. Prior to this, amenorrhea is not considered pathologic. Patients experiencing primary amenorrhea should undergo further evaluation to determine the cause. Common causes of primary amenorrhea include functional hypothalamic amenorrhea, constitutional delays of puberty, gonadal dysgenesis (eg, Turner syndrome), müllerian agenesis, hyperprolactinemia, gonadotropin-releasing hormone deficiency, polycystic ovarian syndrome, and an imperforate hymen. Initial evaluation includes pelvic ultrasonography to ensure the presence of a uterus, followed by measurements of follicle-stimulating hormone, thyroid-stimulating hormone, prolactin, and testosterone to further elucidate the underlying pathology. This patient is 13 years old and demonstrates secondary sexual characteristics, thus she does not meet the definition for primary amenorrhea and her amenorrhea is likely a normal variant. She should undergo reexamination in 1 year.

Incorrect Answers: B, C, D, and E.

Pelvic examination (Choice B) is not necessary at this time because the patient's lack of menarche is not a cause for concern given her age and the presence of secondary sexual characteristics. Additionally, pelvic examination is not frequently performed in patients at 13 years of age.

Karyotype analysis (Choice C) would allow for the evaluation of Turner syndrome and other genetic disorders that may cause a female phenotype with a male genotype,

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Primary amenorrhea is described as the absence of menarche at 15 years of age with appropriate secondary sexual characteristics or at 13 years of age without secondary sexual characteristics. Prior to this, amenorrhea is not considered pathologic. Patients experiencing primary amenorrhea should undergo further evaluation to determine the cause. Common causes of primary amenorrhea include functional hypothalamic amenorrhea, constitutional delays of puberty, gonadal dysgenesis (eg, Turner syndrome), müllerian agenesis, hyperprolactinemia, gonadotropin-releasing hormone deficiency, polycystic ovarian syndrome, and an imperforate hymen. Initial evaluation includes pelvic ultrasonography to ensure the presence of a uterus, followed by measurements of follicle-stimulating hormone, thyroid-stimulating hormone, prolactin, and testosterone to further elucidate the underlying pathology. This patient is 13 years old and demonstrates secondary sexual characteristics, thus she does not meet the definition for primary amenorrhea and her amenorrhea is likely a normal variant. She should undergo reexamination in 1 year.

Incorrect Answers: B, C, D, and E.

Pelvic examination (Choice B) is not necessary at this time because the patient's lack of menarche is not a cause for concern given her age and the presence of secondary sexual characteristics. Additionally, pelvic examination is not frequently performed in patients at 13 years of age.

Karyotype analysis (Choice C) would allow for the evaluation of Turner syndrome and other genetic disorders that may cause a female phenotype with a male genotype, which would prevent menarche, such as complete androgen insensitivity syndrome. This patient has signs of normal pubertal development and does not require further evaluation at this time.

Measurement of serum estradiol concentration (Choice D) is not routinely used in the evaluation of primary amenorrhea. Rather, measurements of follicle-stimulating hormone and luteinizing hormone are used to evaluate hypothalamic and thalamic function.

Transvaginal ultrasonography (Choice E) may be used in the evaluation of primary amenorrhea because the presence or absence of a uterus greatly narrows the differential. This patient is progressing normally at this time and does not require further evaluation with transvaginal ultrasonography.

Educational Objective: Primary amenorrhea refers to the absence of menarche at 15 years of age despite the presence of secondary sexual characteristics or at 13 years of age without the presence of secondary sexual characteristics. Causes include functional hypothalamic amenorrhea, constitutional delays of puberty, gonadal dysgenesis (eg, Turner syndrome), müllerian agenesis, hyperprolactinemia, gonadotropin-releasing hormone deficiency, polycystic ovarian syndrome, and imperforate hymen. Initial evaluation includes pelvic ultrasonography to ensure the presence of a uterus.

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41. A 27-year-old woman comes to the physician because of a 2-week history of intermittent substernal chest pain. She states that the pain is worsened by swallowing solids or liquids. She has a 10-year history of intravenous drug use. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. Examination shows poor dentition and multiple 1- to 2-cm lymph nodes in the cervical and inguinal regions. Cardiac examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) PPD skin test
B) ECG
C) Echocardiography
D) CT scan of the chest
E) Esophagogastroduodenoscopy
F) 24-Hour esophageal pH monitoring

Correct Answer: E.

Esophagogastroduodenoscopy (EGD) involves endoscopic evaluation of the esophagus, stomach, and duodenum. It is indicated for the evaluation of various gastrointestinal pathology, including esophagitis, mucosal neoplasms, peptic ulcers, and chronic gastritis, and can be combined with techniques such as endoscopic ultrasonography and endoscopic retrograde cholangiopancreatography for definitive evaluation of visceral organs and the biliary tree. The patient's clinical constellation of findings including substernal chest pain and dysphagia suggest a diagnosis of esophagitis. Furthermore, in a patient with a history of intravenous drug use and unexplained lymphadenopathy, a new diagnosis of HIV infection complicated by herpes simplex virus, cytomegalovirus, or candida esophagitis is the most likely diagnosis. EGD is the most appropriate test to confirm the cause of her symptoms.

Incorrect Answers: A, B, C, D, and F.

PPD skin test (Choice A) is used to identify patients with latent tuberculosis infections. Tuberculosis is an opportunistic infection which may arrive in patients with HIV infection. However, it is not a typical cause of esophagitis.

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E) Esophagogastroduodenoscopy

F) 24-Hour esophageal pH monitoring

Correct Answer: E.

Esophagogastroduodenoscopy (EGD) involves endoscopic evaluation of the esophagus, stomach, and duodenum. It is indicated for the evaluation of various gastrointestinal pathology, including esophagitis, mucosal neoplasms, peptic ulcers, and chronic gastritis, and can be combined with techniques such as endoscopic ultrasonography and endoscopic retrograde cholangiopancreatography for definitive evaluation of visceral organs and the biliary tree. The patient's clinical constellation of findings including substernal chest pain and dysphagia suggest a diagnosis of esophagitis. Furthermore, in a patient with a history of intravenous drug use and unexplained lymphadenopathy, a new diagnosis of HIV infection complicated by herpes simplex virus, cytomegalovirus, or candida esophagitis is the most likely diagnosis. EGD is the most appropriate test to confirm the cause of her symptoms.

Incorrect Answers: A, B, C, D, and F.

PPD skin test (Choice A) is used to identify patients with latent tuberculosis infections. Tuberculosis is an opportunistic infection which may arrive in patients with HIV infection. However, it is not a typical cause of esophagitis.

Neither ECG (Choice B) nor echocardiography (Choice C) are the most appropriate next step in diagnosis of this patient. The patient's concomitant odynophagia suggests an esophageal rather than cardiac cause of substernal chest pain. Because of this, an EGD is the more appropriate first step than cardiac testing.

CT scan of the chest (Choice D) is a less sensitive test for diagnosing esophagitis. Not only can the esophageal mucosa be directly visualized on EGD, but tissue biopsies can be taken to confirm the diagnosis and also identify the underlying pathogen.

24-Hour esophageal pH monitoring (Choice F) is a test used in the diagnosis of gastroesophageal reflux disease when clinical findings and EGD are not adequate to confirm the diagnosis. While it may cause substernal chest pain, gastroesophageal reflux disease does not typically cause pain during swallowing. Esophagitis is unrelated to the pH in the esophagus.

Educational Objective: Substernal chest pain and odynophagia are consistent with a diagnosis of esophagitis, which may be caused by *Candida*, HSV, or CMV in a patient with HIV. Diagnosis is confirmed by esophagogastroduodenoscopy, which allows for direct visualization and tissue sampling.

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42. A healthy 16-year-old girl is brought to the physician for an examination prior to participation in school sports. She has no history of serious illness, and she is doing well in school. Menarche occurred at the age of 12 years; menses occur at regular 28-day intervals. Her mother and maternal grandmother have hypothyroidism treated with levothyroxine. The patient appears well. She is 168 cm (5 ft 6 in) tall and weighs 75 kg (165 lb); BMI is 27 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 72/min, respirations are 18/min, and blood pressure is 96/70 mm Hg. Examination shows no exophthalmos or lid lag. The thyroid gland is moderately enlarged and firm, but no nodules are palpable. Cardiopulmonary examination shows no abnormalities. The extremities are warm and well perfused. Deep tendon reflexes are 2+, but the Achilles relaxation phase is delayed. Serum studies show:

Thyroid-stimulating hormone	56 µU/mL
Thyroxine (T_4)	6 µg/dL
Antithyroid peroxidase antibodies	>1:1000 (N<1:20)
Thyroglobulin antibodies	1:500 (N<1:20)

Which of the following is the most likely explanation for these findings?

A) Autoimmune infiltration
B) Euthyroid sick syndrome
C) Iodine deficiency
D) Multinodular goiter
E) Presence of thyroid-stimulating hormone receptor antibodies

Correct Answer: A.

This patient's findings are consistent with a diagnosis of chronic lymphocytic thyroiditis which represents an autoimmune infiltration of the thyroid by lymphocytes. Chronic lymphocytic thyroiditis (Hashimoto disease) is the most common form of thyroiditis and is characterized by the presence of antithyroid peroxidase and antithyroglobulin antibodies. Women are disproportionately affected compared to men. The early stages of Hashimoto thyroiditis can present with neck swelling and a diffusely enlarged, nontender thyroid gland. The patient may display evidence of hyperthyroidism from destruction of thyroid follicular cells and the unregulated release of thyroid hormone. However, this patient is asymptomatic. During the chronic stages of Hashimoto thyroiditis, the patient typically develops primary hypothyroidism from the underlying

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Correct Answer: A.

This patient's findings are consistent with a diagnosis of chronic lymphocytic thyroiditis which represents an autoimmune infiltration of the thyroid by lymphocytes. Chronic lymphocytic thyroiditis (Hashimoto disease) is the most common form of thyroiditis and is characterized by the presence of antithyroid peroxidase and antithyroglobulin antibodies. Women are disproportionately affected compared to men. The early stages of Hashimoto thyroiditis can present with neck swelling and a diffusely enlarged, nontender thyroid gland. The patient may display evidence of hyperthyroidism from destruction of thyroid follicular cells and the unregulated release of thyroid hormone. However, this patient is asymptomatic. During the chronic stages of Hashimoto thyroiditis, the patient typically develops primary hypothyroidism from the underlying inflammatory destruction of normal thyroid parenchyma and resultant insufficient production of thyroid hormone. Signs and symptoms during this stage include fatigue, cold intolerance, weight gain, hyporeflexia, myxedema, and dry, cool skin. Fine needle biopsy demonstrates lymphoid infiltrate with the presence of follicles and Hürthle cells. Treatment is with oral replacement of thyroid hormone.

Incorrect Answers: B, C, D, and E.

Euthyroid sick syndrome (Choice B) is the term for laboratory evidence of thyroid dysfunction in an acutely ill patient who has no previous history of thyroid abnormalities. This patient's good state of health and presence of anti-thyroglobulin antibodies suggests a diagnosis of Hashimoto thyroiditis instead.

Iodine deficiency (Choice C) is a cause of hypothyroidism but would not be expected to be present in this case given the otherwise good health of the patient and the lack of a goiter.

Multinodular goiter (Choice D), or toxic multinodular goiter, presents with symptoms of hyperthyroidism and multiple palpable nodules. Laboratory studies demonstrate findings of hyperthyroidism, not hypothyroidism.

Presence of thyroid-stimulating hormone receptor antibodies (Choice E) is the cause of Graves disease, the most common cause of hyperthyroidism. Graves disease presents with symptoms of hyperthyroidism, pretibial myxedema, and thyroid ophthalmopathy, which can cause diplopia, proptosis, and restrictive strabismus.

Educational Objective: Hashimoto disease is the most common form of thyroiditis and is characterized by the presence of antithyroid peroxidase and antithyroglobulin antibodies. Early on, patients may be asymptomatic, but chronic disease presents with signs and symptoms of hypothyroidism, including fatigue, cold intolerance, weight gain, hyporeflexia, myxedema, and dry, cool skin.

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43. A 67-year-old woman comes to the emergency department 6 hours after she noticed a red rash over her arms and abdomen. She has had nosebleeds during the past week. She has a 1-month history of nightly temperatures to 38.3°C (101°F) with night sweats. Eight years ago, she had ovarian cancer and underwent total abdominal hysterectomy, bilateral salpingo-oophorectomy, and omentectomy followed by chemotherapy and filgrastim (GCSF) therapy. She has received conjugated estrogen therapy since the operation. There has been no recurrence of ovarian cancer. She is 168 cm (5 ft 6 in) tall and weighs 59 kg (130 lb); BMI is 21 kg/m^2. Her temperature is 38.3°C (101°F), pulse is 120/min, respirations are 20/min, and blood pressure is 100/70 mm Hg. Examination shows a diffuse petechial rash over the upper extremities and abdomen. The cervical lymph nodes are shoddy and slightly enlarged. Pelvic examination shows no abnormalities. Her hematocrit is 22%, leukocyte count is 30,000/mm^3, and platelet count is 30,000/mm^3. A blood smear shows immature myeloblasts. Which of the following is the most likely cause of this patient's current condition?

A) Adverse effect of anesthetic agent
B) Chemotherapy
C) Estrogen use
D) Filgrastim (GCSF) therapy
E) Recurrence of primary malignancy

Correct Answer: B.

The patient's current presentation is most consistent with acute myelogenous leukemia (AML) which is likely induced by her prior history of chemotherapy for ovarian cancer. AML involves abnormal cells of the myeloid lineage, indicated here by myeloblasts in the peripheral blood, with a variety of defining mutations, each of which portends its own prognosis. The median age at AML diagnosis is 65 years. Risk factors for AML include prior exposure to alkylating chemotherapeutic agents, radiation, presence of myeloproliferative disorders, and Down syndrome. The initial presentation of AML often includes signs and symptoms related to decreased production of other derivatives of the myelogenous cell line, such as anemia indicating decreased production of red blood cells and thrombocytopenia with petechial rash indicating decreased platelet production. Frequent infections may be seen because of decreased concentration of functioning, terminally differentiated white blood cells. Other manifestations can include leukemia cutis, when leukemic cells infiltrate the skin, gingival hyperplasia, disseminated intravascular coagulation, or tumor lysis syndrome. Treatment is with induction chemotherapy, all-trans retinoic acid for the promyelocytic subtype of AML, and allogeneic bone marrow transplantation in patients with poor prognostic factors.

Incorrect Answers: A, C, D, and E

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Correct Answer: B.

The patient's current presentation is most consistent with acute myelogenous leukemia (AML) which is likely induced by her prior history of chemotherapy for ovarian cancer. AML involves abnormal cells of the myeloid lineage, indicated here by myeloblasts in the peripheral blood, with a variety of defining mutations, each of which portends its own prognosis. The median age at AML diagnosis is 65 years. Risk factors for AML include prior exposure to alkylating chemotherapeutic agents, radiation, presence of myeloproliferative disorders, and Down syndrome. The initial presentation of AML often includes signs and symptoms related to decreased production of other derivatives of the myelogenous cell line, such as anemia indicating decreased production of red blood cells and thrombocytopenia with petechial rash indicating decreased platelet production. Frequent infections may be seen because of decreased concentration of functioning, terminally differentiated white blood cells. Other manifestations can include leukemia cutis, when leukemic cells infiltrate the skin, gingival hyperplasia, disseminated intravascular coagulation, or tumor lysis syndrome. Treatment is with induction chemotherapy, all-trans retinoic acid for the promyelocytic subtype of AML, and allogeneic bone marrow transplantation in patients with poor prognostic factors.

Incorrect Answers: A, C, D, and E.

Adverse effect of anesthetic agent (Choice A) is not the cause of this patient's diverse hematologic symptoms. The anesthetic used at the time of her oncologic surgery would not increase her risk for AML, nor would it continue to exert effects nearly a decade later.

Estrogen use (Choice C) increases the risk for estrogen dependent malignancy such as breast cancer but not AML as it is not a hormone sensitive malignancy.

Filgrastim (GCSF) therapy (Choice D) increases the risk for AML slightly, but not as much as do alkylating chemotherapeutic agents. Filgrastim is given with cytotoxic chemotherapy in an effort to prevent chemotherapy-induced neutropenia. As it stimulates the bone marrow, there is a small risk for myeloid neoplasms occurring, however, its reduction in mortality secondary to preventing or improving neutropenia is more significant and thus it continues to be used in treatment of many neoplasms.

Recurrence of primary malignancy (Choice E), in this case, ovarian cancer, would not present with myeloblasts in the peripheral blood. The findings in this case are more consistent with AML which would be a second primary malignancy for this patient.

Educational Objective: Acute myelogenous leukemia is a hematologic malignancy of the myeloid cell line. Risk factors include prior exposure to chemotherapy or radiation, presence of another myeloproliferative disorder, and/or Down syndrome. Fever, anemia, thrombocytopenia, and diffuse lymphadenopathy are common presenting symptoms of AML.

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44. A previously healthy 42-year-old woman has had generalized weakness, lethargy, and double vision for 2 weeks. Examination shows no other abnormalities. X-rays of the chest show an upper anterior mediastinal mass. Which of the following is the most likely diagnosis?

A) Lymphoma
B) Neurogenic tumor
C) Parathyroid tumor
D) Teratoma
E) Thymoma

Correct Answer: E.

This patient's symptoms are consistent with myasthenia gravis, which is associated with thymomas. Myasthenia gravis is an autoimmune disorder of neuromuscular transmission that has a bimodal age of onset, peaking in both young adults (teens to 20s) and older adults (50s to 60s). Patients with myasthenia gravis possess antibodies that block or destroy nicotinic acetylcholine receptors which interferes with neuromuscular junction signaling. Many patients with myasthenia gravis demonstrate thymic hyperplasia or a thymoma, which may be visualized on chest x-ray. Patients present with progressively worsening skeletal muscle weakness at rest and fatigability on activation in focal or generalized muscle groups. The ocular, bulbar, and neck muscles are commonly affected, and patients frequently have double vision, particularly at the end of the day. Most concerningly, respiratory muscle weakness can lead to respiratory insufficiency, and in an acute flare, these patients may require mechanical ventilation. Management includes symptomatic treatments such as acetylcholinesterase inhibitors along with immune-modulating therapies. In patients with or without thymoma, complete thymectomy may be curative.

Incorrect Answers: A, B, C, and D.

Lymphoma (Choice A) encompasses Hodgkin lymphoma and non-Hodgkin lymphoma. It is a potential cause of mediastinal mass, but B symptoms including fever, weight loss, and night sweats are typically seen and there is no association with myasthenia gravis.

Neurogenic tumor (Choice B) is a collection of tumors derived from neural origins such as schwannoma, neurofibroma, neuroblastoma, ganglioneuroblastoma, and

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This patient's symptoms are consistent with myasthenia gravis, which is associated with thymomas. Myasthenia gravis is an autoimmune disorder of neuromuscular transmission that has a bimodal age of onset, peaking in both young adults (teens to 20s) and older adults (50s to 60s). Patients with myasthenia gravis possess antibodies that block or destroy nicotinic acetylcholine receptors which interferes with neuromuscular junction signaling. Many patients with myasthenia gravis demonstrate thymic hyperplasia or a thymoma, which may be visualized on chest x-ray. Patients present with progressively worsening skeletal muscle weakness at rest and fatigability on activation in focal or generalized muscle groups. The ocular, bulbar, and neck muscles are commonly affected, and patients frequently have double vision, particularly at the end of the day. Most concerningly, respiratory muscle weakness can lead to respiratory insufficiency, and in an acute flare, these patients may require mechanical ventilation. Management includes symptomatic treatments such as acetylcholinesterase inhibitors along with immune-modulating therapies. In patients with or without thymoma, complete thymectomy may be curative.

Incorrect Answers: A, B, C, and D.

Lymphoma (Choice A) encompasses Hodgkin lymphoma and non-Hodgkin lymphoma. It is a potential cause of mediastinal mass, but B symptoms including fever, weight loss, and night sweats are typically seen and there is no association with myasthenia gravis.

Neurogenic tumor (Choice B) is a collection of tumors derived from neural origins such as schwannoma, neurofibroma, neuroblastoma, ganglioneuroblastoma, and ganglioneuroma. These are a common cause of posterior mediastinal mass rather than anterior mediastinal mass and do not have an association with myasthenia gravis.

Parathyroid tumors (Choice C), such as parathyroid adenoma (benign) or parathyroid carcinoma (malignant), is a cause of primary hyperparathyroidism which presents with hypercalcemia. In turn, hypercalcemia presents with nephrolithiasis, chronic bone pain, abdominal discomfort, and psychiatric disturbances. This patient's symptoms are more consistent with myasthenia gravis in association with a thymoma.

Teratoma (Choice D) is a germ cell tumor that contains tissue from one or all three germ cell layers (endoderm, mesoderm, ectoderm) which results from abnormal migration of pluripotent stem cells during development. It can also present as a mediastinal mass. However, there is not association with myasthenia gravis.

Educational Objective: Myasthenia gravis is an autoimmune disorder of neuromuscular transmission. Patients present with progressively worsening skeletal muscle weakness at rest and fatigability on activation in focal or generalized muscle groups. Many patients with myasthenia gravis demonstrate thymic hyperplasia or a thymoma, which may be visualized on chest x-ray. Resection of the thymoma often causes myasthenia gravis to resolve.

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45. A 72-year-old man is brought to the emergency department by his wife because of fever and chills for 2 hours. He visited the physician 2 days ago because of burning with urination, and urine cultures were ordered. He was an artillery officer 40 years ago, and his wife says that his hearing is deteriorating. He has a sulfa allergy. He appears moderately ill. His temperature is 38.3°C (101°F). Examination shows left costovertebral angle tenderness. His leukocyte count is 15,000/mm^3 with a shift to the left. Urinalysis shows many bacilli. Urine culture and sensitivity show an organism that is sensitive only to nitrofurantoin, gentamicin, amikacin, tobramycin, trimethoprim-sulfamethoxazole, and ciprofloxacin. Which of the following is the most appropriate pharmacotherapy?

A) Amikacin
B) Ampicillin
C) Ciprofloxacin
D) Gentamicin
E) Nitrofurantoin

Correct Answer: C.

This patient is presenting with signs and symptoms of pyelonephritis including fever, chills, flank pain, and costovertebral angle tenderness. Pyelonephritis is an infection of the kidney that commonly results from retrograde spread of a lower urinary tract infection. Lower urinary tract infection symptoms include dysuria, frequency, urgency, incontinence, and suprapubic pain. If untreated, bacteria can travel up the ureter to infect the kidney, resulting in pyelonephritis. Urine may be dark colored or foul smelling. Urinalysis in pyelonephritis often shows >10 leukocytes/hpf, may show red cells as evidence of mucosal inflammation (or concomitant nephrolithiasis), and may show white blood cell casts. Bacteria are generally seen on microscopy, with gram-negative rods being the most common pathogen. Antibiotic choice should be tailored to microbial sensitivities as well as choosing an antibiotic that is an appropriate strength for the infection. In the case of pyelonephritis, a third-generation cephalosporin such as ceftriaxone, a fluoroquinolone such as ciprofloxacin, trimethoprim/sulfamethoxazole, or an oral β-lactam (eg, amoxicillin/clavulanate, cefuroxime, cefpodoxime) should be given. Care should be taken to avoid adverse effects that may be damaging to a patient (eg, hearing loss and aminoglycoside antibiotics) when possible.

Incorrect Answers: A, B, D, and E.

Amikacin (Choice A) is an aminoglycoside and is not first-line in the treatment of pyelonephritis. Aminoglycoside usage may also be complicated by nephrotoxicity or

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D) Gentamicin

E) Nitrofurantoin

Correct Answer: C.

This patient is presenting with signs and symptoms of pyelonephritis including fever, chills, flank pain, and costovertebral angle tenderness. Pyelonephritis is an infection of the kidney that commonly results from retrograde spread of a lower urinary tract infection. Lower urinary tract infection symptoms include dysuria, frequency, urgency, incontinence, and suprapubic pain. If untreated, bacteria can travel up the ureter to infect the kidney, resulting in pyelonephritis. Urine may be dark colored or foul smelling. Urinalysis in pyelonephritis often shows >10 leukocytes/hpf, may show red cells as evidence of mucosal inflammation (or concomitant nephrolithiasis), and may show white blood cell casts. Bacteria are generally seen on microscopy, with gram-negative rods being the most common pathogen. Antibiotic choice should be tailored to microbial sensitivities as well as choosing an antibiotic that is an appropriate strength for the infection. In the case of pyelonephritis, a third-generation cephalosporin such as ceftriaxone, a fluoroquinolone such as ciprofloxacin, trimethoprim/sulfamethoxazole, or an oral β-lactam (eg, amoxicillin/clavulanate, cefuroxime, cefpodoxime) should be given. Care should be taken to avoid adverse effects that may be damaging to a patient (eg, hearing loss and aminoglycoside antibiotics) when possible.

Incorrect Answers: A, B, D, and E.

Amikacin (Choice A) is an aminoglycoside and is not first-line in the treatment of pyelonephritis. Aminoglycoside usage may also be complicated by nephrotoxicity or ototoxicity.

Ampicillin (Choice B) is typically used to treat infections caused primarily by gram-positive bacteria, such as *Streptococcus, Staphylococcus*, and *Listeria*. Urine culture has not been shown to be sensitive to ampicillin in this patient.

Gentamicin (Choice D), an aminoglycoside antibiotic, is commonly used to treat neonatal sepsis, meningitis, pneumonia, pelvic inflammatory disease, endocarditis, and osteomyelitis; however, it is ototoxic, nephrotoxic, and neurotoxic, making it suboptimal when alternatively suitable and safer medications are available.

Nitrofurantoin (Choice E) can be used in the treatment of uncomplicated urinary tract infections and cystitis but is less suitable for pyelonephritis.

Educational Objective: Pyelonephritis should be treated with a third-generation cephalosporin such as ceftriaxone, a fluoroquinolone such as ciprofloxacin, trimethoprim/sulfamethoxazole, or an oral β-lactam (amoxicillin/clavulanate, cefuroxime, cefpodoxime).

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46. A 19-year-old man comes to the physician because of frequent nosebleeds over the past 3 weeks. He has bipolar disorder currently well controlled with lithium carbonate, bupropion, and valproic acid. Physical examination shows no abnormalities except for dried blood in the nares. Mental status examination shows an anxious mood and slight motor restlessness. Serum studies show a lithium carbonate concentration of 1.3 mEq/L (therapeutic range=0.6–1.2), and valproic acid concentration of 77 µg/mL (therapeutic range=40–100). Which of the following is the most appropriate next step in management?

A) Measurement of serum AST activity
B) Measurement of serum bupropion concentration
C) Platelet count
D) Discontinuation of lithium carbonate therapy
E) Discontinuation of valproic acid therapy

Correct Answer: C.

Valproic acid is an anticonvulsant medication with mood stabilizing properties utilized in seizure disorders, bipolar disorder, and schizoaffective disorder. It works by increasing the availability of gamma-aminobutyric acid and antagonizing voltage-gated sodium channels in the brain. At therapeutic doses, valproic acid can cause adverse effects such as gastrointestinal distress, sedation, tremor, weight gain, hematologic effects (eg, leukopenia, thrombocytopenia), and hepatic effects that range from benign increases in transaminases to hepatotoxicity. Patients with signs of thrombocytopenia (eg, epistaxis, prolonged bleeding from cuts, petechiae, blood in the urine or stool) should have their platelet count assessed. If the platelet count is decreased, valproic acid should be discontinued or decreased. Weight, complete blood count, and liver function should be monitored regularly in patients taking valproate.

Incorrect answers: A, B, D, and E.

Measurement of serum AST activity (Choice A) is indicated in patients on valproic acid demonstrating signs of hepatic failure (eg, jaundice). However, this patient is demonstrating bleeding, a sign of platelet dysfunction or deficiency.

Measurement of serum bupropion concentration (Choice B) is unlikely to be informative because bupropion is not associated with hematologic adverse effects. Bupropion

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D) Discontinuation of lithium carbonate therapy

E) Discontinuation of valproic acid therapy

Correct Answer: C.

Valproic acid is an anticonvulsant medication with mood stabilizing properties utilized in seizure disorders, bipolar disorder, and schizoaffective disorder. It works by increasing the availability of gamma-aminobutyric acid and antagonizing voltage-gated sodium channels in the brain. At therapeutic doses, valproic acid can cause adverse effects such as gastrointestinal distress, sedation, tremor, weight gain, hematologic effects (eg, leukopenia, thrombocytopenia), and hepatic effects that range from benign increases in transaminases to hepatotoxicity. Patients with signs of thrombocytopenia (eg, epistaxis, prolonged bleeding from cuts, petechiae, blood in the urine or stool) should have their platelet count assessed. If the platelet count is decreased, valproic acid should be discontinued or decreased. Weight, complete blood count, and liver function should be monitored regularly in patients taking valproate.

Incorrect answers: A, B, D, and E.

Measurement of serum AST activity (Choice A) is indicated in patients on valproic acid demonstrating signs of hepatic failure (eg, jaundice). However, this patient is demonstrating bleeding, a sign of platelet dysfunction or deficiency.

Measurement of serum bupropion concentration (Choice B) is unlikely to be informative because bupropion is not associated with hematologic adverse effects. Bupropion is associated with dizziness, insomnia, and, at high doses, seizure risk.

Discontinuation of lithium carbonate therapy (Choice D) is unnecessary because signs of thrombocytopenia are more consistent with valproic acid therapy than lithium therapy. However, given that this patient's lithium concentration is slightly supratherapeutic, his dosage should be decreased appropriately.

Discontinuation of valproic acid therapy (Choice E) is necessary in cases of severe thrombocytopenia. However, first, the platelet count should be determined. Some cases of less severe valproic acid-induced thrombocytopenia improve with dose decreases rather than discontinuation.

Educational Objective: Valproic acid is an anticonvulsant medication with mood stabilizing properties utilized in bipolar disorder. Serious adverse effects include hematologic effects (eg, leukopenia, thrombocytopenia) and hepatotoxicity. Patients on valproic acid who develop epistaxis should have their platelet count assessed.

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47. A previously healthy 52-year-old man comes to the physician because of a 6-month history of difficulty swallowing solids and liquids. He has had a 2.3-kg (5-lb) weight loss during this period. Examination shows no abnormalities. An upper gastrointestinal series with barium contrast is shown. Which of the following is the most likely diagnosis?

A) Achalasia
B) Hiatal hernia
C) Leiomyoma of the esophagus
D) Pharyngoesophageal (Zenker) diverticulum
E) Schatzki ring

Correct Answer: A

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Correct Answer: A.

Achalasia is a type of esophageal dysmotility disorder resulting from deficient peristalsis along the length of the esophagus and impaired relaxation of the lower esophageal sphincter (LES). It manifests with dysphagia to both liquids and solids, odynophagia, weight loss, halitosis, and regurgitation of undigested food. The cause of primary achalasia is unknown. Secondary achalasia may occur in the setting of malignancy (particularly gastric carcinoma), Chagas disease, amyloidosis, sarcoidosis, eosinophilic esophagitis, and CREST syndrome. It is diagnosed through a barium swallow plus esophageal manometry. On barium swallow, achalasia classically appears as a dilated esophagus with distal taper, as seen in the accompanying picture. Treatment includes pneumatic dilation or injection of botulinum toxin to relax the LES.

Incorrect Answers: B, C, D, and E.

Hiatal hernia (Choice B) is often asymptomatic, but it can present with epigastric or lower chest pain, acid reflux, or nausea; dysphagia is generally less likely to be present, unless the patient demonstrates a severe paraesophageal hiatal hernia, which is not observed on this study (note the subdiaphragmatic location of the lower esophageal sphincter).

Leiomyoma of the esophagus (Choice C) is typically a slow-growing submucosal tumor that may undergo malignant transformation. Esophageal malignancies typically present with progressive dysphagia symptoms initially to solids and later to liquids.

Pharyngoesophageal (Zenker) diverticulum (Choice D) typically presents with halitosis, regurgitation of undigested food, and dysphagia. Barium swallow discloses a posterior, midline outpouching above or at the level of the cricopharyngeus, which is not seen in this study.

Schatzki ring (Choice E) is a circumferential band of tissue that partially occludes the esophageal lumen and will appear as a thin, ringed defect on barium esophagography. Patients typically present with intermittent dysphagia to solids.

Educational Objective: Achalasia results from the destruction of neurons in the myenteric plexus resulting in dysfunctional esophageal peristalsis and a chronically increased LES tone. Presenting symptoms typically include dysphagia to both liquids and solids along with regurgitation; progressive dilation of the esophagus with a distal taper is seen on barium swallow. Treatment is with pneumatic dilation or botulinum toxin to relax the LES.

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48. A 21-year-old woman comes to the physician because she has not had a menstrual period since she stopped using an oral contraceptive 10 months ago. Menarche was at the age of 14 years, and menses had occurred at regular 28-day intervals before starting an oral contraceptive 3 years ago. She is not sexually active. She is 165 cm (5 ft 5 in) tall and weighs 63 kg (140 lb); BMI is 23 kg/m^2. Her blood pressure is 120/58 mm Hg. Examination shows no hirsutism or other abnormalities. Serum studies show a thyroid-stimulating hormone concentration of 3 µU/mL, prolactin concentration of 20 ng/mL, and free thyroxine concentration of 2 ng/dL (N=0.8–2.4). A progestin challenge test shows withdrawal bleeding. Which of the following is the most likely diagnosis?

A) Anovulation
B) Hyperandrogenism
C) Hyperprolactinemia
D) Hypogonadotropic hypogonadism (Kallmann syndrome)
E) Outflow tract obstruction
F) Pregnancy

Correct Answer: A.

Secondary amenorrhea is defined as the absence of menses for 3 months in women who have previously had regular menstrual cycles or for 6 months in women whose cycles were previously irregular. Common causes include pregnancy, anovulation, polycystic ovarian syndrome, premature ovarian failure, functional hypothalamic amenorrhea, pituitary or thyroid disorders (eg, prolactinoma, hyper- or hypothyroidism), and intrauterine adhesions. Evaluation of secondary amenorrhea commonly includes a thorough history and physical examination, pregnancy test, and measurements of follicle-stimulating hormone, prolactin, and thyroid-stimulating hormone. A progesterone challenge test can also be performed if laboratory studies are unrevealing. If the withdrawal of progesterone results in endometrial bleeding, this indicates that the patient has an adequate production of estrogen but inappropriate timing of her hormonal cycle to cause ovulation. If withdrawal bleeding does not occur, there is a deficiency of estrogen (eg, primary ovarian failure), an outflow tract obstruction, or hypothalamic-pituitary axis dysfunction. This patient has normal laboratory studies and did demonstrate withdrawal bleeding with the progesterone challenge, making anovulation the most likely cause of her amenorrhea.

Incorrect Answers: B, C, D, E, and F.

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cycles were previously irregular. Common causes include pregnancy, anovulation, polycystic ovarian syndrome, premature ovarian failure, functional hypothalamic amenorrhea, pituitary or thyroid disorders (eg, prolactinoma, hyper- or hypothyroidism), and intrauterine adhesions. Evaluation of secondary amenorrhea commonly includes a thorough history and physical examination, pregnancy test, and measurements of follicle-stimulating hormone, prolactin, and thyroid-stimulating hormone. A progesterone challenge test can also be performed if laboratory studies are unrevealing. If the withdrawal of progesterone results in endometrial bleeding, this indicates that the patient has an adequate production of estrogen but inappropriate timing of her hormonal cycle to cause ovulation. If withdrawal bleeding does not occur, there is a deficiency of estrogen (eg, primary ovarian failure), an outflow tract obstruction, or hypothalamic-pituitary axis dysfunction. This patient has normal laboratory studies and did demonstrate withdrawal bleeding with the progesterone challenge, making anovulation the most likely cause of her amenorrhea.

Incorrect Answers: B, C, D, E, and F.

Hyperandrogenism (Choice B) can cause amenorrhea in the setting of polycystic ovarian syndrome (PCOS). However, PCOS is also commonly associated with obesity, hirsutism, and acne, which this patient does not demonstrate.

Hyperprolactinemia (Choice C) can cause amenorrhea, with other presenting symptoms including galactorrhea. This patient's prolactin concentration was normal, making hyperprolactinemia an unlikely cause of her amenorrhea.

Hypogonadotropic hypogonadism (Kallmann syndrome) (Choice D) is a genetic disorder caused by gonadotropin-releasing hormone deficiency. This would present with decreased concentrations of follicle-stimulating and luteinizing hormones as well as primary, rather than secondary, amenorrhea. Anosmia would also likely be present.

Outflow tract obstruction (Choice E) can be caused by cervical stenosis or uterine adhesions in the setting of prior uterine instrumentation. However, withdrawal bleeding would not occur with a progesterone challenge in the setting of an outflow tract obstruction.

Pregnancy (Choice F) is unlikely because this patient has been amenorrheic for 10 months and shows no signs of pregnancy. Anovulation is a more likely cause of her amenorrhea.

Educational Objective: Secondary amenorrhea refers to the absence of menstruation for 3 months in patients that previously had regular periods or 6 months in patients whose periods were irregular. Evaluation includes a pregnancy test along with the measurement of follicle-stimulating hormone, prolactin, and thyroid-stimulating hormone concentrations. A progesterone challenge test can also be performed, with withdrawal bleeding indicating anovulation as the likely cause of amenorrhea.

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49. A previously healthy 4-year-old boy is brought to the physician because of increasing left ear pain for 2 weeks. His temperature is 38.5°C (101.3°F). Examination of the left ear shows an erythematous, bulging tympanic membrane and an edematous auditory canal with a small amount of mucopurulent discharge. The ear appears to be displaced laterally, and there is moderate tenderness in the area behind the ear. Examination of the right ear shows no abnormalities. A 1-cm, freely mobile, nontender mass is palpated over the left anterior neck. Examination of the pharynx shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Monospot test
B) Tympanography
C) CT scan of the temporal bone
D) Hydrocortisone/polymyxin/neomycin ear drops
E) Oral amoxicillin therapy

Correct Answer: C.

Mastoiditis is a bacterial infection of the mastoid air cells of the temporal bone and often occurs as a sequela of acute otitis media. The peak incidence is in children, especially those younger than 2 years of age. The most commonly implicated organisms are gram-positive organisms such as *Streptococcus pneumoniae* or pyogenes or *Staphylococcus aureus*. Children often have a history of concomitant or preceding otitis media, and present with signs and symptoms including fever, lethargy, otalgia, and post-auricular swelling, erythema, and tenderness. The ear may be displaced laterally and the tympanic membrane, if visible, is often swollen and erythematous. Mastoiditis can have severe complications, including meningitis, cerebral abscess, subperiosteal abscess, Bezold abscess (a neck abscess near the attachment of the sternocleidomastoid muscle), facial nerve palsy, and permanent hearing loss. While imaging is not necessary for many children with mastoiditis, the presence of severe illness, an uncertain clinical picture, or complications (such as subperiosteal abscess, as in this case) warrants further evaluation with a CT scan of the temporal bone. Treatment includes intravenous antibiotics with or without surgical management with tympanostomy or mastoidectomy to achieve source control of the infection.

Incorrect Answers: A, B, D, and E.

Monospot test (Choice A) is useful for the diagnosis of infection with Epstein-Barr virus (EBV). EBV infection causes infectious mononucleosis. While infectious

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Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Monospot test (Choice A) is useful for the diagnosis of infection with Epstein-Barr virus (EBV). EBV infection causes infectious mononucleosis. While infectious mononucleosis may present with cervical adenopathy, it does not lead to marked postauricular swelling with lateral displacement of the auricle, which is more suggestive of a subperiosteal abscess secondary to mastoiditis.

Tympanography (Choice B) is useful for the detection of a middle ear effusion secondary to acute or chronic otitis media. It plays little role in the evaluation of mastoiditis.

Hydrocortisone/polymyxin/neomycin ear drops (Choice D) is useful for the treatment of otitis externa but has little role in the management of mastoiditis, which typically requires parenteral antibiotic therapy.

Oral amoxicillin therapy (Choice E) is commonly used to treat acute otitis media but is inadequate for the treatment of mastoiditis. Intravenous vancomycin is the preferred agent for the treatment of mastoiditis, although surgical intervention is also usually necessary.

Educational Objective: Mastoiditis is a bacterial infection of the mastoid air cells of the temporal bone and often occurs as a sequela of acute otitis media. Children often present with signs and symptoms including fever, lethargy, otalgia, and post-auricular swelling, erythema, and tenderness. Children with evidence of complicated disease (suggested by the presence of subperiosteal abscess) should undergo further radiographic evaluation with a CT scan of the temporal bone.

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50. A 52-year-old woman comes to the physician because of tremors in her hands for 4 months. She only fills teacups halfway to avoid spilling, and she has difficulty lifting a spoonful of soup to her mouth without spilling it. Her children noticed tremors of her head 5 years ago. She has no history of serious illness and takes no medications. She is 168 cm (5 ft 6 in) tall and weighs 56 kg (123 lb); BMI is 20 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 12/min, and blood pressure is 110/70 mm Hg. Examination shows a tremor of the outstretched hands bilaterally; the amplitude of the tremor increases with finger-nose testing. The tremor resolves at rest. Muscle strength and tone are intact, and her gait is normal. Which of the following is the most appropriate pharmacotherapy?

A) Carbamazepine
B) Diazepam
C) Fluoxetine
D) Levodopa-carbidopa
E) Propranolol

Correct Answer: E.

Essential tremor is a common adult action tremor that most commonly presents as a bilateral tremor of the upper extremities. Action tremors are exacerbated by activity and sustained antigravity postures and improved by rest. Essential tremors specifically are exacerbated by stress and improved by small quantities of alcohol. The tremors may progressively involve more body regions over time, including the extremities, head, and voice. The pathogenesis of essential tremor is unknown, though it is commonly heritable. The first-line treatment is as-needed or scheduled propranolol, a β-adrenergic blocker medication.

Incorrect Answers: A, B, C, and D.

Carbamazepine (Choice A) is an anticonvulsant medication with mood stabilizing properties utilized in seizure disorders and bipolar disorder. It is not useful in essential tremor.

Diazepam (Choice B) is a benzodiazepine medication utilized to treat anxiety and seizures. Benzodiazepines are sometimes used as second-line agents for essential tremor but are less safe than propranolol for long-term therapy given their addictive potential and withdrawal effects.

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B) Diazepam
C) Fluoxetine
D) Levodopa-carbidopa
E) Propranolol

Correct Answer: E.

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Fluoxetine (Choice C) is an antidepressant medication utilized in major depressive disorder and anxiety disorders. It is not useful in essential tremor.

Levodopa-carbidopa (Choice D) is a dopamine precursor that improves movement difficulties in Parkinson disease. It is not useful in essential tremor.

Educational Objective: Essential tremor is a common adult action tremor that most commonly presents as a bilateral tremor of the upper extremities. The first-line treatment is propranolol.

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1. A previously healthy 22-year-old man comes to the emergency department because of a 1-day history of burning and tingling around his mouth and in his arms and legs. During this time, cold water has felt "burning hot" when he washes his hands, and cool beverages have felt hot in his mouth. Two days ago, he ate grouper and mussels at a restaurant. One hour after eating, he had nausea, vomiting, and diarrhea, which lasted 24 hours and resolved spontaneously. He takes no medications. Vital signs are within normal limits. Muscle strength is 5/5 throughout. Deep tendon reflexes are absent throughout. Babinski sign is absent. Sensation is intact. Which of the following is the most likely diagnosis?

A) Botulism
B) *Campylobacter jejuni* infection
C) Ciguatera poisoning
D) Conversion disorder
E) Guillain-Barré syndrome

Correct Answer: C.

This patient is likely suffering from ciguatera poisoning, which is caused by a neurotoxin found in several large reef fish (eg, moray eel, grouper, barracuda). This toxin commonly leads to sensory-predominant neurologic symptoms (eg, paresthesia, temperature dysesthesia, pruritus, painful sensations that one's teeth are loose, painful urination) along with transient gastrointestinal upset, vomiting, and diarrhea. Neurologic symptoms may last weeks. Uncommonly, bradycardia or heart block may occur. Diagnosis is typically made by clinical history. Treatment is supportive and may involve fluid resuscitation and symptomatic treatment of nausea and neurologic symptoms.

Incorrect Answers: A, B, D, and E.

Botulism (Choice A) is an acute disease of the neuromuscular junction caused by the exposure to the *Clostridium botulinum toxin* (eg, in raw honey or improperly canned foods). Over the course of hours to days, patients develop symmetric hypotonia and hyporeflexia that begins with the cranial nerves and descends to the lower extremities. Sensory symptoms would be atypical, and this patient did not consume canned foods or raw honey.

Campylobacter jejuni infection (Choice B) typically presents with enteritis (acute abdominal pain and diarrhea) that persists an average of 7 days, inconsistent with this

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C) Ciguatera poisoning
D) Conversion disorder
E) Guillain-Barré syndrome

Correct Answer: C.

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Campylobacter jejuni infection (Choice B) typically presents with enteritis (acute abdominal pain and diarrhea) that persists an average of 7 days, inconsistent with this patient's gastrointestinal symptoms lasting 24 hours. A latent complication of *Campylobacter jejuni* infection is Guillain-Barré syndrome (Choice E), which typically occurs 1 to 2 weeks after gastrointestinal symptoms (inconsistent with this patient's time course). Guillain-Barré syndrome usually presents with acute, symmetric, ascending muscle weakness with hyporeflexia. Many patients also demonstrate autonomic dysfunction and/or sensory symptoms. However, this patient does not demonstrate weakness with hyporeflexia.

Conversion disorder (Choice D), also known as functional neurologic disorder, involves neurologic symptoms such as sensory or motor dysfunction that are not fully explained by objective findings on physical examination or imaging. This patient's objective findings are consistent with ciguatera poisoning.

Educational Objective: Ciguatera poisoning arises from consuming neurotoxins found in large reef fish. Patients typically present with sensory-predominant neurologic symptoms (eg, temperature dysesthesia, paresthesia) and transient gastrointestinal upset.

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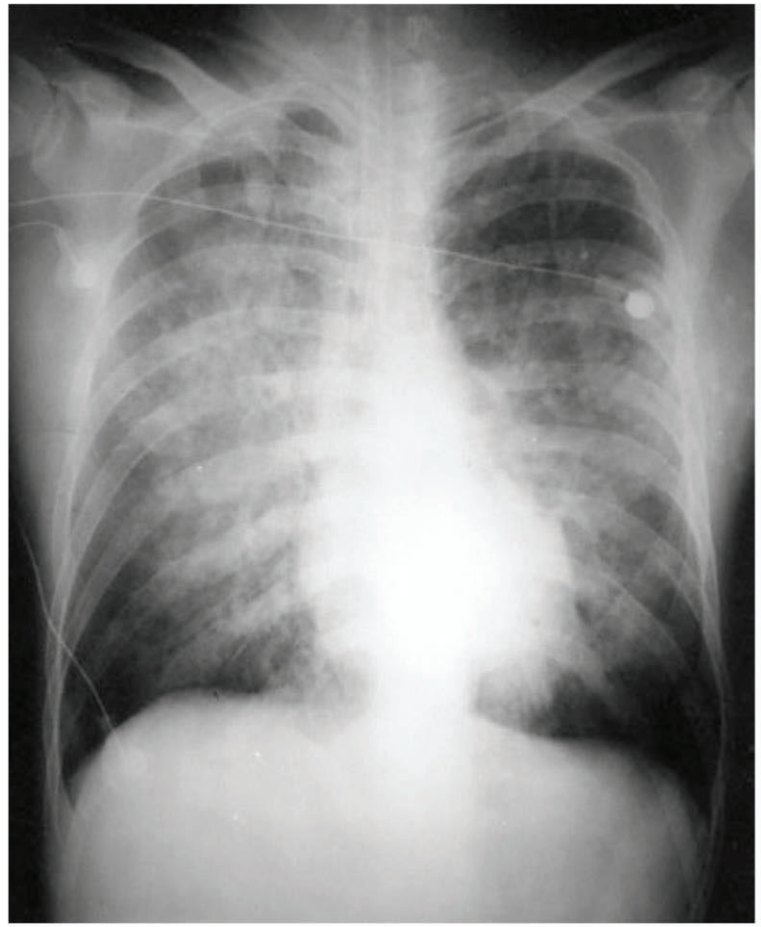
2. A 37-year-old woman is brought to the emergency department because of a 3-day history of progressive shortness of breath, cough productive of rust-colored sputum, and temperatures to 38.9°C (102°F). Four years ago, she underwent splenectomy for injuries sustained during a motor vehicle collision. Her temperature is 39°C (102.2°F), pulse is 120/min, respirations are 22/min, and blood pressure is 105/60 mm Hg. Examination shows no jugular venous distention. On pulmonary examination, there are diffuse inspiratory wheezes and crackles heard at the right lung base. Cardiac examination shows no abnormalities. The extremities are cyanotic, and there is no edema. Arterial blood gas analysis on 2 L/min of oxygen by nasal cannula shows:

pH	7.39
Pco_2	38 mm Hg
Po_2	41 mm Hg
HCO_3^-	22 mEq/L
O_2 saturation	79%

A chest x-ray is shown. Which of the following is the most likely diagnosis?



A) Acute respiratory distress syndrome
B) Hypersensitivity pneumonitis
C) Lymphangioleiomyomatosis
D) Miliary tuberculosis
E) Sarcoidosis

Correct Answer: A.

The patient's presentation is consistent with acute respiratory distress syndrome (ARDS). ARDS is characterized by acute onset, diffuse, inflammatory lung injury and

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Correct Answer: A.

The patient's presentation is consistent with acute respiratory distress syndrome (ARDS). ARDS is characterized by acute onset, diffuse, inflammatory lung injury and bilateral pulmonary infiltrates on chest imaging leading to respiratory failure. Causes include sepsis (especially in the setting of gram-negative bacteria caused by macrophage overactivation by lipopolysaccharide), pneumonia, trauma, chemical pneumonitis (eg, aspiration), acute pancreatitis, blood product transfusions, medications, and amniotic fluid embolism. Alveolar damage and inflammation lead to increased permeability of the alveolar-capillary interface, and a proteinaceous exudate forms a thick hyaline membrane around the alveolar epithelium that impairs gas exchange. ARDS is associated with significant morbidity and mortality, and the patient should be admitted for advanced respiratory support and monitoring.

Incorrect Answers: B, C, D, and E.

Hypersensitivity pneumonitis (Choice B) can present in acute, subacute, or chronic forms, with the acute form characterized by shortness of breath, cough, and systemic symptoms such as fever, chills, headache, and rash following exposure to an environmental irritant.

Lymphangioleiomyomatosis (Choice C) is a rare neoplasm of perivascular epithelioid cells that most commonly affects the lungs. It is recommended to obtain a chest CT to evaluate for the characteristic thin-walled, diffusely distributed pulmonary cysts. The presence of bilateral infiltrates on chest x-ray is more likely to be ARDS.

Miliary tuberculosis (Choice D) is caused by the hematologic dissemination of *Mycobacterium tuberculosis*, and commonly involves the lungs, lymphatic system, bones, liver, and central nervous system. Characteristic imaging findings include a faint, uniform distribution of small nodular opacities throughout the lungs.

Sarcoidosis (Choice E) is a chronic noncaseating granulomatous disease, most commonly presenting with bilateral hilar lymphadenopathy and possible coarse, upper lobe-predominant reticular pulmonary opacities.

Educational Objective: ARDS is characterized by the acute onset of diffuse, bilateral, noncardiogenic pulmonary infiltrates and respiratory failure. ARDS results from cytokine-mediated injury to the pulmonary parenchyma, especially the alveolar epithelium and endothelium, resulting in diffuse alveolar injury with consequent exudative fluid filling the alveolar spaces.

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3. A 24-year-old woman comes to the physician because of a 2-day history of moderate pain and swelling of her left ankle that began when she stepped in a hole while running. She says she continued running for 20 minutes afterward but stopped because she twisted the ankle again. Use of ice, bandages, and crutches has provided moderate relief. She has no history of previous ankle injury or serious illness. She takes ibuprofen as needed for pain. Vital signs are within normal limits. Dorsalis pedis pulses are 2+ bilaterally. The left anterior talofibular and calcaneofibular ligaments are tender to palpation; there is no bony tenderness to palpation of the forefoot, hindfoot, or ankle bilaterally. Anterior drawer test is 0 in the right ankle and 2+ in the left. Talar tilt test is 0 in the right ankle and 1+ in the left. The patient is able to dorsiflex and plantar flex both feet and ankles and flex and extend all toes. Sensation to light touch is intact over the lower extremities. Which of the following is the most appropriate next step in management to prevent morbidity in this patient?

A) Extra-articular platelet-derived growth factor injection
B) Immobilization in a short-leg cast
C) Physical therapy
D) Surgical reconstruction of the ankle
E) Taping of the ankle

Correct Answer: C.

Use of a soft protective brace and early range of motion exercises through physical therapy is the next most appropriate step in management for this patient who most likely has an ankle sprain. Twisting injuries of the ankle are common and more frequently result from inversion injuries to the lateral ankle. The most important step in the evaluation of ankle injuries is to determine if the patient requires imaging to rule out a clinically significant fracture. This can be done in the office setting by applying the Ottawa ankle rules. If there is pain in the malleolar region, as in this patient, ankle x-ray is only required if there is pain with palpation of the posterior edge or tip of the medial or lateral malleolus, or if the patient is unable to bear weight for more than four steps (two with each foot). Additionally, if there is midfoot pain with tenderness at the base of the fifth metatarsal or the navicular bone, then imaging is warranted. This patient exhibits anterior pain of the lateral malleolus and is able to walk by herself, thus, she does not require imaging and should instead receive a soft protective brace to stabilize the ankle followed by early movement with physical therapy to reduce the risk for chronic morbidity.

Incorrect Answers: A, B, D, and E.

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E) Taping of the ankle

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Extra-articular platelet-derived growth factor injection (Choice A) shows promise in the treatment of certain musculoskeletal soft tissue and joint injuries but does not have demonstrated effectiveness in improving functional outcomes for patients with a lateral ankle sprain.

Immobilization in a short-leg cast (Choice B) is not recommended for low-grade ankle sprains. Early mobilization and physical rehabilitation improves outcomes.

Surgical reconstruction of the ankle (Choice D) has not been demonstrated to improve functional outcomes in patients with lateral ankle sprain injuries compared to conservative treatment and early mobilization.

Taping of the ankle (Choice E) may reduce the risk for recurrent injury in patients with a prior lateral ankle sprain; however, initial management consists of rest, icing, elevation, compression with an elastic wrap, soft protective bracing, and physical therapy.

Educational Objective: The Ottawa ankle rules can be used to assess whether or not a patient with an ankle injury requires imaging. X-ray is not required if the patient is able to walk at least four steps unassisted and does not have pain over the posterior edge or the tip of either the lateral or medial malleolus, or pain over the base of the fifth metatarsal or navicular bone. Appropriate treatment involves the use of a soft brace and early mobilization with physical therapy.

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4. A 42-year-old woman is admitted to the hospital 2 hours after the onset of pain and numbness in her left arm; she is having difficulty moving her arm. Two weeks ago, she was diagnosed with right popliteal venous thrombosis, and treatment with heparin and warfarin was begun. The left upper extremity is pale and cool; sensation to touch is decreased in a glove distribution distal to the mid forearm. Strength of the intrinsic muscles of the left hand is 2/5. Her prothrombin time is 14 sec (INR=1.3). An uncomplicated brachial embolectomy is performed. Which of the following is most likely to confirm the diagnosis?

A) Arch and left subclavian arteriography
B) CT angiography of the chest
C) MR venography of the right lower extremity
D) Transesophageal echocardiography
E) Venous duplex scan of the right lower extremity

Correct Answer: D.

The patient is presenting with signs and symptoms of acute limb ischemia, which is characterized by pain, pallor, poikilothermia, pulselessness, paresthesia, and paralysis. Arterial thromboembolism is the most common cause of acute upper extremity limb ischemia, typically from a cardiogenic source such as atrial fibrillation, valvular heart disease, left ventricular aneurysm or hypokinesis, left atrial myxoma, or infective endocarditis. In this patient, the presence of a venous thrombus raises concern for an intracardiac or intrapulmonary shunt that has allowed passage of a paradoxical embolism from the venous circulation to the systemic circulation, bypassing the lungs. Paradoxical emboli may traverse through a patent foramen ovale, atrial septal defect, ventricular septal defect, or pulmonary arteriovenous malformation. Patients are at risk for stroke, acute limb ischemia, and thromboembolic injury to organs. Transesophageal echocardiography is the best diagnostic test to confirm the diagnosis. A bubble study, in which agitated saline is introduced to the venous system and timed until it is visualized in the left side of the heart, can help distinguish between intracardiac and intrapulmonary shunting.

Incorrect Answers: A, B, C, and E.

Arch and left subclavian arteriography (Choice A) and CT angiography of the chest (Choice B) can be useful to assess for vascular abnormalities that may increase risk for thromboembolic disease to the left upper extremity, such as thoracic outlet compression, brachial or axillary artery intimal hyperplasia, aneurysm, or dissection. CT

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D) Transesophageal echocardiography

E) Venous duplex scan of the right lower extremity

Correct Answer: D.

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MR venography of the right lower extremity (Choice C) and venous duplex scan of the right lower extremity (Choice E) are imaging modalities that can diagnosis acute or chronic venous thrombosis in the limb and assess for clot extension or progression. Additional imaging of the right lower extremity will not aid in diagnosing the cause of her acute upper left extremity findings.

Educational Objective: Arterial thromboembolism is the most common cause of acute upper extremity limb ischemia, typically from a cardiogenic source. Non-cardiogenic embolic disease may originate from abnormalities of the upper extremity arterial supply or from paradoxical emboli that cross from the venous to systemic circulations through an intracardiac or intrapulmonary shunt.

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5. A 71-year-old woman comes to the physician for a follow-up examination. She has chronic obstructive pulmonary disease, hypertension, and osteoporosis. She quit smoking 15 years ago. She is currently able to walk two blocks without shortness of breath, which is her baseline. Current medications include albuterol, alendronate, beclomethasone, chlorthalidone, and lisinopril. Her blood pressure is 135/80 mm Hg. Physical examination shows no abnormalities. The lungs are clear. Screening mammography 18 months ago showed no abnormalities. She has no history of abnormal mammograms and there is no family history of breast cancer. She asks whether she should continue to receive annual mammography to screen for breast cancer. Which of the following is the most appropriate recommendation by the physician?

A) Continue to receive periodic screening mammography until the age of 74 years and then consider discontinuing it based on her overall health

B) Discontinue screening mammography based on national recommendations for women and the patient's age

C) Discontinue screening mammography because the patient's life expectancy is decreased as a result of her underlying illnesses

D) Receive breast MRI rather than mammography to screen for breast cancer based on the patient's age

E) Receive screening mammography every other year for the rest of the patient's life

Correct Answer: A.

Breast cancer is the most common non-dermatologic cancer of women in the United States. It encompasses many types of breast carcinoma, including invasive ductal and lobular carcinoma, medullary carcinoma, inflammatory breast carcinoma, and cystosarcoma phyllodes, with the most common type being invasive ductal carcinoma. Risk factors for the development of breast cancer include exogenous estrogen administration, a family history of breast cancer, genetic mutations (eg, *BRCA1* or *2*), early menarche, late menopause, nulliparity, obesity, and African American ethnicity. It most commonly presents with an abnormal, potentially palpable, breast lump, with or without associated skin or nipple retraction. However, many cases are asymptomatic and found on routine screening mammography. In patients at average or moderate risk for developing breast cancer, the American College of Obstetricians and Gynecologists (ACOG) recommends a screening mammogram every 1 to 2 years starting at age 40 years and continuing until age 74 years. Screening should also be offered for patients 75 years of age or older, if they are expected to live for at least another 10 years. High risk patients (eg, those with *BRCA* mutations) should undergo an annual breast MRI. This patient is at average risk for developing breast cancer and, thus, should continue to receive periodic screening mammography until the age of 74 years and then consider discontinuing based on her overall health.

Incorrect Answers: B, C, D, and E.

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D) Receive breast MRI rather than mammography to screen for breast cancer based on the patient's age

E) Receive screening mammography every other year for the rest of the patient's life

Correct Answer: A.

Breast cancer is the most common non-dermatologic cancer of women in the United States. It encompasses many types of breast carcinoma, including invasive ductal and lobular carcinoma, medullary carcinoma, inflammatory breast carcinoma, and cystosarcoma phyllodes, with the most common type being invasive ductal carcinoma. Risk factors for the development of breast cancer include exogenous estrogen administration, a family history of breast cancer, genetic mutations (eg, *BRCA1* or *2*), early menarche, late menopause, nulliparity, obesity, and African American ethnicity. It most commonly presents with an abnormal, potentially palpable, breast lump, with or without associated skin or nipple retraction. However, many cases are asymptomatic and found on routine screening mammography. In patients at average or moderate risk for developing breast cancer, the American College of Obstetricians and Gynecologists (ACOG) recommends a screening mammogram every 1 to 2 years starting at age 40 years and continuing until age 74 years. Screening should also be offered for patients 75 years of age or older, if they are expected to live for at least another 10 years. High risk patients (eg, those with *BRCA* mutations) should undergo an annual breast MRI. This patient is at average risk for developing breast cancer and, thus, should continue to receive periodic screening mammography until the age of 74 years and then consider discontinuing based on her overall health.

Incorrect Answers: B, C, D, and E.

Discontinuing screening because of the patient's age (Choice B) or underlying illnesses (Choice C) would be inappropriate. Appropriate recommendations for this patient include continuing periodic mammography screening every 1 to 2 years until she is age 74 years, at which point assessment of her underlying illnesses should be used to determine the benefit of further screening.

Receiving breast MRI rather than mammography to screen for breast cancer based on the patient's age (Choice D) is incorrect. Routine screening mammography is the most common modality used in a majority of women. Breast MRI is often reserved for high-risk patients.

This patient does not need to receive screening mammography every other year for the rest of her life (Choice E). She should continue to receive routine mammography until the age of 74 years, at which time evaluation of her underlying illnesses and life expectancy should be used to guide the decision for further screening.

Educational Objective: Screening mammography is recommended every 1 to 2 years from the ages of 40 to 74 years for patients at average to moderate risk for breast cancer. After 74 years of age, screening can be continued if the patient's total life expectancy is more than 10 years.

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6. A 19-year-old patient, gravida 1, para 1, is examined 1 hour after spontaneous vaginal delivery of a healthy male newborn at term. Pregnancy was uncomplicated. The patient dropped out of high school during the second trimester. The newborn's father is 19 years of age and is incarcerated for possession of an illicit drug. The patient says the men in her family have histories of aggression, substance abuse, arrests, and incarcerations. She is concerned that her child will follow a similar path. The patient has no history of serious illness. Her only medication is a prenatal vitamin. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Arrange for a visiting nurse follow-up examination after discharge
B) Contact child protective services
C) Recommend the patient have no contact with the newborn's father
D) Recommend the patient place the newborn for adoption
E) Recommend psychiatric evaluation of the newborn at 4 years of age

Correct Answer: A.

A visiting nurse should be arranged to follow up with this patient and her son after discharge. While many social and environmental circumstances can contribute to behavioral abnormalities, such as aggression and substance use disorder, these behavioral issues are much less commonly genetic in nature. Common psychiatric causes for these sorts of behaviors include conduct disorder and antisocial personality disorder; however, there is not a consistent genetic cause to these disorders. This patient otherwise had a healthy, uncomplicated pregnancy and delivery, and no further intervention is warranted at this time to attempt to prevent behavioral disorders in the child.

Incorrect Answers: B, C, D, and E.

Contacting child protective services (Choice B) is not necessary. The patient does not use substances, appears to have had adequate prenatal care, and is otherwise healthy. She had a healthy pregnancy and delivery, with no concerns requiring the intervention of child protective services. Additionally, the child's father who does use illicit substances is incarcerated, which will likely reduce their interaction.

Recommend the patient have no contact with the newborn's father (Choice C) is inappropriate. While the patient's partner is incarcerated because of the use of illicit

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D) Recommend the patient place the newborn for adoption

E) Recommend psychiatric evaluation of the newborn at 4 years of age

Correct Answer: A.

A visiting nurse should be arranged to follow up with this patient and her son after discharge. While many social and environmental circumstances can contribute to behavioral abnormalities, such as aggression and substance use disorder, these behavioral issues are much less commonly genetic in nature. Common psychiatric causes for these sorts of behaviors include conduct disorder and antisocial personality disorder; however, there is not a consistent genetic cause to these disorders. This patient otherwise had a healthy, uncomplicated pregnancy and delivery, and no further intervention is warranted at this time to attempt to prevent behavioral disorders in the child.

Incorrect Answers: B, C, D, and E.

Contacting child protective services (Choice B) is not necessary. The patient does not use substances, appears to have had adequate prenatal care, and is otherwise healthy. She had a healthy pregnancy and delivery, with no concerns requiring the intervention of child protective services. Additionally, the child's father who does use illicit substances is incarcerated, which will likely reduce their interaction.

Recommend the patient have no contact with the newborn's father (Choice C) is inappropriate. While the patient's partner is incarcerated because of the use of illicit substances, the provider may risk resentment from the patient by suggesting this, which may prevent her and her son from receiving adequate health care in the future.

Recommend the patient place the newborn for adoption (Choice D) is not necessary. The patient does not use substances, appears to have had adequate prenatal care, and is otherwise healthy. She had a healthy pregnancy and delivery with no concerns mentioned regarding her ability to care for the child.

Recommend psychiatric evaluation of the newborn at 4 years of age (Choice E) is not necessary at this time. It is likely that this patient's family members have social and behavioral issues caused by environmental or social factors rather than by a familial disorder.

Educational Objective: Many environmental and social circumstances affect the behavioral development of a child. Family members with a history of significant behavioral issues (eg, illegal activities, incarceration, drug use) do not necessarily lead to an increased inheritance risk for behavioral disorders in a child.

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7. A 55-year-old man comes to the office because of a 3-month history of episodes of mild, intermittent, mid chest pain. He says that the episodes occur 3 days weekly and last 2 to 3 minutes. The pain has not increased since his episodes began, and it is relieved by rest and use of antacids. He has not had shortness of breath, nausea, wheezing, or light-headedness. He has hypertension and asthma. His medications are lisinopril, hydrochlorothiazide, and albuterol. He does not smoke cigarettes. He drinks four glasses of wine on weekends. He works as an automobile mechanic. His pulse is 78/min, respirations are 16/min, and blood pressure is 142/84 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 97%. Cardiopulmonary examination shows no abnormalities. An ECG shows a normal sinus rhythm and no ST-T wave changes. Which of the following is the most appropriate next step in diagnosis?

A) Cardiac catheterization
B) Exercise stress test
C) Quantitative coronary artery calcium scoring
D) Rest-redistribution thallium scan
E) No further testing is indicated

Correct Answer: B.

Coronary artery disease (CAD) is usually a result of atherosclerotic plaque buildup over many years. Depending on the degree of CAD, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work, such as exercise. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina. If myocardial ischemia is severe enough and not reversed, which occurs in cases of plaque rupture, it results in myocardial infarction. Many individuals with CAD will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Exercise stress tests, including stress echocardiography, are employed in an attempt to identify areas of decreased perfusion. If an exercise stress test discloses signs of severe coronary artery disease, cardiac catheterization may be necessary.

Incorrect Answers: A, C, D, and E.

Cardiac catheterization (Choice A) would be appropriate in a patient with myocardial infarction or acute coronary syndrome (ACS). This patient does not have any signs or symptoms of ACS such as severe, non-remitting chest pain, shortness of breath, diaphoresis, or nausea, and ECG does not show ST segment elevation or depression.

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D) Rest-redistribution thallium scan

E) No further testing is indicated

Correct Answer: B.

Coronary artery disease (CAD) is usually a result of atherosclerotic plaque buildup over many years. Depending on the degree of CAD, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work, such as exercise. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina. If myocardial ischemia is severe enough and not reversed, which occurs in cases of plaque rupture, it results in myocardial infarction. Many individuals with CAD will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Exercise stress tests, including stress echocardiography, are employed in an attempt to identify areas of decreased perfusion. If an exercise stress test discloses signs of severe coronary artery disease, cardiac catheterization may be necessary.

Incorrect Answers: A, C, D, and E.

Cardiac catheterization (Choice A) would be appropriate in a patient with myocardial infarction or acute coronary syndrome (ACS). This patient does not have any signs or symptoms of ACS such as severe, non-remitting chest pain, shortness of breath, diaphoresis, or nausea, and ECG does not show ST segment elevation or depression.

Quantitative coronary artery calcium scoring (Choice C) can be done to assess cardiovascular risk in asymptomatic patients with intermediate risk for CAD. In this patient who has symptoms consistent with angina, exercise stress test is more appropriate.

Rest-redistribution thallium scan (Choice D) is typically done in patients known to have CAD to evaluate for viable versus nonviable myocardium and assess for the chance of functional recovery after revascularization.

No further testing (Choice E) would be inappropriate in this patient who may be presenting with angina. Evaluation of CAD should be done to decrease risk for myocardial infarction, heart failure, and overall morbidity and mortality.

Educational Objective: Chest pain that improves with rest is suggestive of angina pectoris, caused by cardiac ischemia from insufficient perfusion through narrowed coronary arteries. An exercise stress test can help diagnose CAD, which may require intervention.

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8. Four days after admission to the hospital for management of cellulitis of the right lower extremity, a 70-year-old woman has an increased serum creatinine concentration. She has type 2 diabetes mellitus. Her medications are glipizide and a multivitamin; she also has received intravenous nafcillin since admission. She is retired from the military. Vital signs are within normal limits. Examination of the trunk shows no abnormalities. There is edema, erythema, and warmth of the right lower extremity. Examination of the left lower extremity shows no abnormalities. On admission, her serum creatinine concentration was 0.9 mg/dL. Today, laboratory studies show:

Hemoglobin	11 g/dL
Hemoglobin A_{1c}	7.5%
Leukocyte count	15,000/mm^3
Segmented neutrophils	75%
Bands	1%
Eosinophils	8%
Lymphocytes	14%
Monocytes	2%
Serum	
K^+	5 mEq/L
Urea nitrogen	60 mg/dL
Creatinine	2.3 mg/dL
Phosphorus	4.3 mg/dL
Albumin	2 g/dL
Cholesterol	250 mg/dL
Urine	
pH	6.00
Protein	trace
RBC	10/hpf
WBC	20–50/hpf
RBC casts	0/lpf
WBC casts	0/lpf

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Urea nitrogen	60 mg/dL
Creatinine	2.3 mg/dL
Phosphorus	4.3 mg/dL
Albumin	2 g/dL
Cholesterol	250 mg/dL
Urine	
pH	6.00
Protein	trace
RBC	10/hpf
WBC	20–50/hpf
RBC casts	0/lpf
WBC casts	0/lpf

Serum complement concentrations are within the reference ranges. Which of the following is the most likely diagnosis?

A) Acute cortical necrosis
B) Acute interstitial nephritis
C) Acute tubular necrosis
D) Obstructive uropathy
E) Rhabdomyolysis
F) Urinary tract infection

Correct Answer: B.

Acute interstitial nephritis (AIN) is a cause of intrinsic renal failure, and often occurs secondary to medication use, with non-steroidal anti-inflammatory medications, antibiotics, and sulfas being common precipitants. It is characterized by decreased glomerular filtration rate, rising creatinine, and eosinophilic infiltrates seen on biopsy and detected on urinalysis. Patients will have a history of medication exposure, and classically present with low-grade fever and diffuse rash. Urinalysis typically discloses

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F) Urinary tract infection

Correct Answer: B.

Acute interstitial nephritis (AIN) is a cause of intrinsic renal failure, and often occurs secondary to medication use, with non-steroidal anti-inflammatory medications, antibiotics, and sulfas being common precipitants. It is characterized by decreased glomerular filtration rate, rising creatinine, and eosinophilic infiltrates seen on biopsy and detected on urinalysis. Patients will have a history of medication exposure, and classically present with low-grade fever and diffuse rash. Urinalysis typically discloses eosinophiluria, with occasional WBC casts, increased WBC/hpf, and proteinuria. Treatment involves discontinuing the inciting agent.

Incorrect Answers: A, C, D, E, and F.

Acute cortical necrosis (Choice A) is a known cause of acute kidney injury and is typically caused by decreased renal arterial perfusion such as in shock, disseminated intravascular coagulation, or vascular spasm.

Acute tubular necrosis (Choice C) often follows an ischemic or nephrotoxic insult and is commonly seen in patients with cardiac arrest following prolonged resuscitation prior to return of spontaneous circulation, and in patients with prolonged cardiogenic, obstructive, distributive, or hypovolemic shock. Nephrotoxic agents can also precipitate acute tubular necrosis, such as heavy metals and myoglobin. It is characterized on urinalysis by proteinuria, increased WBC/hpf, muddy brown casts, and visualized tubular epithelial cells on urine microscopy.

Obstructive uropathy (Choice D) can occur at a variety of anatomic sites including the ureter (eg, nephrolithiasis, retroperitoneal fibrosis), bladder (eg, bladder malignancy), prostate (eg, benign prostatic hyperplasia, malignancy), or urethra (eg, stricture). Nephrolithiasis typically presents with microscopic hematuria without pyuria and flank pain. The other causes of obstructive uropathy are chronic rather than acute.

Rhabdomyolysis (Choice E) is an acute breakdown of muscle tissue leading to increased serum concentrations of myoglobin that accumulate in the kidneys, increasing the risk for acute renal failure. This may occur in healthy adults after periods of high intensity physical activity. It may also occur in patients with seizure disorders and in elderly patients who have fallen and are found down after a long period of time as compression of the muscle tissue leads to break down.

Urinary tract infection (Choice F) can present with pyuria and hematuria but typically presents with symptoms including dysuria, urinary urgency, and frequency.

Educational Objective: AIN is caused by a hypersensitivity reaction to medications (eg, NSAIDs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria

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Acute interstitial nephritis (AIN) is a cause of intrinsic renal failure, and often occurs secondary to medication use, with non-steroidal anti-inflammatory medications, antibiotics, and sulfas being common precipitants. It is characterized by decreased glomerular filtration rate, rising creatinine, and eosinophilic infiltrates seen on biopsy and detected on urinalysis. Patients will have a history of medication exposure, and classically present with low-grade fever and diffuse rash. Urinalysis typically discloses eosinophiluria, with occasional WBC casts, increased WBC/hpf, and proteinuria. Treatment involves discontinuing the inciting agent.

Incorrect Answers: A, C, D, E, and F.

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Obstructive uropathy (Choice D) can occur at a variety of anatomic sites including the ureter (eg, nephrolithiasis, retroperitoneal fibrosis), bladder (eg, bladder malignancy), prostate (eg, benign prostatic hyperplasia, malignancy), or urethra (eg, stricture). Nephrolithiasis typically presents with microscopic hematuria without pyuria and flank pain. The other causes of obstructive uropathy are chronic rather than acute.

Rhabdomyolysis (Choice E) is an acute breakdown of muscle tissue leading to increased serum concentrations of myoglobin that accumulate in the kidneys, increasing the risk for acute renal failure. This may occur in healthy adults after periods of high intensity physical activity. It may also occur in patients with seizure disorders and in elderly patients who have fallen and are found down after a long period of time as compression of the muscle tissue leads to break down.

Urinary tract infection (Choice F) can present with pyuria and hematuria but typically presents with symptoms including dysuria, urinary urgency, and frequency.

Educational Objective: AIN is caused by a hypersensitivity reaction to medications (eg, NSAIDs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria, hematuria, eosinophilia, and urine eosinophils.

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9. A 29-year-old woman with systemic lupus erythematosus comes to the office because of a 5-day history of moderate pain in the right elbow, left knee, and left foot. There is no recent history of trauma. She has no history of sexually transmitted disease or other serious illness. Menses occur at regular 28-day intervals; her last menstrual period ended 2 days ago. Her only medication is methotrexate. She is sexually active with two male partners and uses condoms inconsistently. She is 173 cm (5 ft 8 in) tall and weighs 84 kg (185 lb); BMI is 28 kg/m^2. Her temperature is 38.5°C (101.3°F); other vital signs are within normal limits. A photograph of the left foot is shown. Examination of the skin shows no other abnormalities. Analysis of synovial fluid shows a leukocyte count of 50,000/mm^3. Cultures of blood and synovial fluid grow no organisms. Which of the following is the most likely diagnosis?

A) Exacerbation of systemic lupus erythematosus
B) Gout
C) Hepatitis B
D) HIV infection
E) *Neisseria gonorrhoeae* infection

Correct Answer: E.

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E) *Neisseria gonorrhoeae* infection

Correct Answer: E.

Disseminated gonococcal infection with *Neisseria gonorrhoeae* best explains this patient's constellation of symptoms and findings. Disseminated gonococcal infection occurs in less than 5% of patients infected with *N. gonorrhoeae* but is a common cause of polyarthralgia or migratory polyarthritis in young, sexually active adults. The most common presentation of disseminated gonococcal infection is the triad of polyarthralgia, tenosynovitis, and rash. The rash typically presents with painless hemorrhagic bullae or pustules, which have a predilection for the distal extremities. Only macules may be present, as in this case, in which there is at least one slightly reddish-purple macule at the base of the third digit. Septic arthritis may also be present in disseminated gonococcal infection but is not required. This patient's synovial fluid findings suggest septic arthritis because of the leukocyte count of 50,000/mm^3. It is common for *N. gonorrhoeae* not to be identified on culture of synovial fluid. Definitive diagnosis of disseminated gonococcal infection is based on identification of *N. gonorrhoeae* by either culture or nucleic acid amplification testing from any specimen. Even without definitive proof, a clinical diagnosis can be made and treatment begun with intravenous ceftriaxone, the recommended first-line antimicrobial therapy.

Incorrect Answers: A, B, C, and D.

Exacerbation of systemic lupus erythematosus (Choice A) would not explain the greatly increased leukocyte count in the synovial fluid or this patient's rash on the distal extremities. Typical cutaneous features of systemic lupus erythematosus include a malar rash, alopecia (hair loss), discoid lesions, and photosensitivity.

Gout (Choice B) is an inflammatory arthropathy incited by hyperuricemia, with deposition of uric acid crystals inside the joint and surrounding tissues. This type of arthritis presents following consumption of a purine-rich meal or alcohol (which competes with renal excretion of uric acid). A joint aspirate would show negatively birefringent

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occurs in less than 5% of patients infected with *N. gonorrhoeae* but is a common cause of polyarthralgia or migratory polyarthritis in young, sexually active adults. The most common presentation of disseminated gonococcal infection is the triad of polyarthralgia, tenosynovitis, and rash. The rash typically presents with painless hemorrhagic bullae or pustules, which have a predilection for the distal extremities. Only macules may be present, as in this case, in which there is at least one slightly reddish-purple macule at the base of the third digit. Septic arthritis may also be present in disseminated gonococcal infection but is not required. This patient's synovial fluid findings suggest septic arthritis because of the leukocyte count of 50,000/mm^3. It is common for *N. gonorrhoeae* not to be identified on culture of synovial fluid. Definitive diagnosis of disseminated gonococcal infection is based on identification of *N. gonorrhoeae* by either culture or nucleic acid amplification testing from any specimen. Even without definitive proof, a clinical diagnosis can be made and treatment begun with intravenous ceftriaxone, the recommended first-line antimicrobial therapy.

Incorrect Answers: A, B, C, and D.

Exacerbation of systemic lupus erythematosus (Choice A) would not explain the greatly increased leukocyte count in the synovial fluid or this patient's rash on the distal extremities. Typical cutaneous features of systemic lupus erythematosus include a malar rash, alopecia (hair loss), discoid lesions, and photosensitivity.

Gout (Choice B) is an inflammatory arthropathy incited by hyperuricemia, with deposition of uric acid crystals inside the joint and surrounding tissues. This type of arthritis presents following consumption of a purine-rich meal or alcohol (which competes with renal excretion of uric acid). A joint aspirate would show negatively birefringent needle-shaped crystals and a leukocyte count of typically <50,000 cells/mm^3.

Hepatitis B (Choice C) would not explain the concomitant joint pain, septic arthritis, and rash in this patient. Acute hepatitis B infection presents with general malaise, fatigue, anorexia, jaundice, and right upper quadrant pain.

HIV infection (Choice D) should always be considered when examining an unusual rash in a sexually active patient. However, the patient's constellation of findings is more classic for disseminated gonococcal infection caused by *N. gonorrhoeae*.

Educational Objective: Disseminated gonococcal infection with *Neisseria gonorrhoeae* classically presents with a triad of polyarthralgia, tenosynovitis, and rash. The rash typically presents with painless hemorrhagic bullae or pustules, which have a predilection for the distal extremities. Septic arthritis may be present and often the synovial fluid culture is negative for organisms. Definitive diagnosis is based on identification of *N. gonorrhoeae* by either culture or nucleic acid amplification testing, but a presumptive clinical diagnosis is sufficient to begin treatment with ceftriaxone, the recommended first-line antimicrobial therapy.

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10. A 7-month-old boy is brought to the office by his mother because of a 1-day history of fussiness. His mother says several children at the patient's day-care center have been sick during the past week. He has had no change in appetite. His immunizations are up-to-date. He has no history of serious illness and receives no medications. He is at the 10th percentile for length, 15th percentile for weight, and 50th percentile for head circumference. His temperature is 37.2°C (99.0°F), pulse is 110/min, and respirations are 32/min. Pulse oximetry on room air shows an oxygen saturation of 97%. There are mild intercostal retractions. On pulmonary examination, mild wheezes are heard throughout the lung fields. The remainder of the examination shows no abnormalities. There is no change in examination findings after administration of nebulized albuterol. Which of the following is the most appropriate next step in management?

A) Complete blood count
B) Oral azithromycin therapy
C) Oral prednisolone therapy
D) Racemic epinephrine
E) No further management is indicated at this time

Correct Answer: E.

In this infant with signs and symptoms of bronchiolitis, no further management is indicated at this time. Bronchiolitis is a common cause of lower respiratory tract infection in children under the age of 2 years. It is typically caused by a viral infection, commonly from respiratory syncytial virus (RSV). It presents with a viral prodrome of fever, nasal congestion, and rhinorrhea followed by cough, dyspnea, and lethargy as inflammation progresses to the lower airway. Auscultation may reveal wheezes and crackles. Severe disease is marked by the presence of increased respiratory effort (tachypnea, accessory muscle use, intercostal retractions, nasal flaring, grunting), hypoxemia, and apnea. While this patient has mild retractions, he is not hypoxic or showing other signs of impending respiratory distress. In this case, supportive care at home is adequate treatment. However, patients with severe disease should be hospitalized and immediately started on respiratory support with the administration of oxygen, nasal suctioning, and advanced airway and ventilatory support if respiratory failure is imminent.

Incorrect Answer: A, B, C, and D.

Complete blood count (Choice A) is not necessary in the work of up bronchiolitis, which is a clinical diagnosis. It may be useful in evaluating for leukocytosis if pneumonia

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E) No further management is indicated at this time

Correct Answer: E.

In this infant with signs and symptoms of bronchiolitis, no further management is indicated at this time. Bronchiolitis is a common cause of lower respiratory tract infection in children under the age of 2 years. It is typically caused by a viral infection, commonly from respiratory syncytial virus (RSV). It presents with a viral prodrome of fever, nasal congestion, and rhinorrhea followed by cough, dyspnea, and lethargy as inflammation progresses to the lower airway. Auscultation may reveal wheezes and crackles. Severe disease is marked by the presence of increased respiratory effort (tachypnea, accessory muscle use, intercostal retractions, nasal flaring, grunting), hypoxemia, and apnea. While this patient has mild retractions, he is not hypoxic or showing other signs of impending respiratory distress. In this case, supportive care at home is adequate treatment. However, patients with severe disease should be hospitalized and immediately started on respiratory support with the administration of oxygen, nasal suctioning, and advanced airway and ventilatory support if respiratory failure is imminent.

Incorrect Answer: A, B, C, and D.

Complete blood count (Choice A) is not necessary in the work of up bronchiolitis, which is a clinical diagnosis. It may be useful in evaluating for leukocytosis if pneumonia or bacteremia were suspected, but there is no indication of a systemic bacterial infection in this case.

Oral azithromycin therapy (Choice B) is not necessary in the treatment of bronchiolitis as it is caused by a virus, usually RSV. Antibiotic therapy will not hasten recovery and will increase community bacterial resistance.

Oral prednisolone therapy (Choice C) is not indicated in the treatment of bronchiolitis. Systemic corticosteroids are used in the treatment of croup, or laryngotracheobronchitis, which can also be caused by RSV but is an infection of the larynx rather than the lower respiratory tract. Unlike bronchiolitis, laryngotracheobronchitis presents with stridor and barking cough.

Like systemic corticosteroids, racemic epinephrine (Choice D) is used in the management of laryngotracheobronchitis, not bronchiolitis.

Educational Objective: Bronchiolitis is a common lower respiratory tract infection in children less than 2 years of age, often secondary to infection with RSV. In severe cases, treatment entails supplemental oxygen, frequent nasal suctioning, and consideration of an advanced airway. In mild cases, patients can recover at home with supportive care.

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11. A 64-year-old woman comes to the office because of an enlarging, painless mass in her left cheek that she first noticed 2 months ago. She says the mass has doubled in size during this time. She has not sustained any trauma to the area. She was diagnosed with chronic obstructive pulmonary disease 2 years ago. She takes no medications. She has smoked one pack of cigarettes daily for 50 years. Her pulse is 96/min, respirations are 16/min, and blood pressure is 136/90 mm Hg. The left cheek at the mandibular angle is larger than the right; a 2 × 2-cm mass fixed to the underlying tissue is palpated. There is no lymphadenopathy. Ultrasonography shows a 2 × 2-cm mass in the superficial left parotid gland. Which of the following is the most appropriate next step in diagnosis?

A) Excision of the mass
B) Left sialography
C) MRI of the brain and neck
D) PET scan
E) Observation only

Correct Answer: A.

Excision is the next appropriate step in diagnosing the cause of this mass. Features of this patient's history and physical examination that raise concern for malignancy include the tumor's increasing size, lack of pain, firmness, and fixation to underlying tissue. The ultrasonography findings, localizing the mass to the parotid gland, suggest that the mass may be a salivary gland tumor. For this reason, the most important next step is to make a pathologic diagnosis by excising the mass or by performing a fine-needle aspiration or ultrasonography-guided core needle biopsy. Salivary gland tumors most frequently arise from the parotid gland and may be benign (pleomorphic adenoma, Warthin tumor) or malignant (mucoepidermoid carcinoma, adenoid cystic carcinoma). Less commonly, a lymphoma or metastatic squamous cell carcinoma or melanoma presents as a parotid mass. Because a specimen is needed for histopathologic assessment to determine the best course of treatment, excision of the mass is the most appropriate next step in diagnosis in this case.

Incorrect Answers: B, C, D, and E.

Left sialography (Choice B) is a radiographic study performed after a small amount of contrast is injected into the salivary duct. While it will help determine the patency of the salivary ducts, it will provide any information regarding the histologic diagnosis of the tumor and whether it is benign or malignant.

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E) Observation only

Correct Answer: A.

Excision is the next appropriate step in diagnosing the cause of this mass. Features of this patient's history and physical examination that raise concern for malignancy include the tumor's increasing size, lack of pain, firmness, and fixation to underlying tissue. The ultrasonography findings, localizing the mass to the parotid gland, suggest that the mass may be a salivary gland tumor. For this reason, the most important next step is to make a pathologic diagnosis by excising the mass or by performing a fine-needle aspiration or ultrasonography-guided core needle biopsy. Salivary gland tumors most frequently arise from the parotid gland and may be benign (pleomorphic adenoma, Warthin tumor) or malignant (mucoepidermoid carcinoma, adenoid cystic carcinoma). Less commonly, a lymphoma or metastatic squamous cell carcinoma or melanoma presents as a parotid mass. Because a specimen is needed for histopathologic assessment to determine the best course of treatment, excision of the mass is the most appropriate next step in diagnosis in this case.

Incorrect Answers: B, C, D, and E.

Left sialography (Choice B) is a radiographic study performed after a small amount of contrast is injected into the salivary duct. While it will help determine the patency of the salivary ducts, it will provide any information regarding the histologic diagnosis of the tumor and whether it is benign or malignant.

MRI of the brain and neck (Choice C) is not necessary at this time. The ultrasonography already performed has provided adequate information for the excision or biopsy to be performed. Based on the results of the histopathologic examination, MRI of the brain and neck may be needed for surgical planning, but it is not indicated at this time.

PET scan (Choice D) is useful in staging malignancy and examining if there has been metastatic spread. However, the first step in making a diagnosis of malignancy is to obtain tissue for histopathologic examination. If it demonstrates a benign tumor, then a PET scan is not necessary and can be avoided.

Observation only (Choice E) is inappropriate as this is mass is clearly enlarging and highly concerning for malignancy. Any delay in diagnosis of cancer leads to the possibility of upstaging, when the stage of the tumor increases because of continued growth, which then consequently further diminishes prognosis.

Educational Objective: When confronted with an enlarging mass of any kind with concerning features for malignancy such as lack of pain, firmness, or fixation to underlying tissue, tissue sampling by fine needle aspiration, core needle biopsy, excisional biopsy, or excision is indicated. The best technique for sampling a mass is dependent on the location of the mass and suspected pathology but obtaining tissue for histopathologic diagnosis is paramount.

https://t.me/USMLENBME2CK

12. A 62-year-old man, who is recovering in the coronary care unit following an acute ST-segment elevation anterior wall myocardial infarction 4 days ago, is being evaluated for the sudden onset of dyspnea and diaphoresis. At the time of admission, tissue plasminogen activator therapy was initiated, and the patient's recovery had been uncomplicated. Medical history otherwise is unremarkable, and he takes no routine medications. Vital signs are temperature 37°C (98.6°F), pulse 128/min, respirations 36/min, and blood pressure 82/58 mm Hg. Pulse oximetry on 100% oxygen via nonrebreather face mask shows an oxygen saturation of 89%. Jugular venous pressure is 8 cm H_2O (N=5–9). Auscultation of the lungs discloses diffuse crackles halfway up the back. Cardiac examination discloses a hyperdynamic precordium and a grade 3/6 holosystolic murmur that was not present on previous examinations. There is no clubbing, cyanosis, or edema of the extremities. Based on these findings, the patient's condition is most likely attributable to which of the following?

A) Aortic valvular insufficiency
B) Chordae tendineae rupture
C) Extension of myocardial infarction
D) Left ventricular free wall rupture
E) Tricuspid valve insufficiency

Correct Answer: B.

Chordae tendineae rupture is a potentially life-threatening mechanical complication of acute myocardial infarction. Ischemic injury can result in papillary muscle necrosis and rupture of associated chordae tendineae that anchor the leaflets of the mitral valve to the ventricle and prevent regurgitation during ventricular systole. When ruptured, there is no support structure to keep the mitral valve leaflets closed, thus the increased left ventricular pressure forces them back into the left atrium with consequent mitral regurgitation. Depending on the severity, this can result in acutely decompensated heart failure, and surgical repair may be necessary. The diagnosis is supported by the sudden onset of symptoms, presence of pulmonary rales, and discovery of a new holosystolic murmur on examination. Mechanical complications of myocardial infarction typically occur several days after the initial insult because cardiac function improves with an increase in intraventricular pressure and the progression of inflammation weakens the structural integrity of the myocardium.

Incorrect Answers: A, C, D, and E.

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Chordae tendineae rupture is a potentially life-threatening mechanical complication of acute myocardial infarction. Ischemic injury can result in papillary muscle necrosis and rupture of associated chordae tendineae that anchor the leaflets of the mitral valve to the ventricle and prevent regurgitation during ventricular systole. When ruptured, there is no support structure to keep the mitral valve leaflets closed, thus the increased left ventricular pressure forces them back into the left atrium with consequent mitral regurgitation. Depending on the severity, this can result in acutely decompensated heart failure, and surgical repair may be necessary. The diagnosis is supported by the sudden onset of symptoms, presence of pulmonary rales, and discovery of a new holosystolic murmur on examination. Mechanical complications of myocardial infarction typically occur several days after the initial insult because cardiac function improves with an increase in intraventricular pressure and the progression of inflammation weakens the structural integrity of the myocardium.

Incorrect Answers: A, C, D, and E.

Aortic valvular insufficiency (Choice A) presents with an early diastolic decrescendo murmur best heard in the right second intercostal space, and is most commonly associated with endocarditis, acute rheumatic fever, and aortic root dilation.

Extension of myocardial infarction (Choice C) is less likely given the successful initial coronary reperfusion with thrombolytics, and presumed continuation of appropriate pharmacotherapy for management of acute myocardial infarction while admitted to the coronary care unit. The sudden onset of severe symptoms, heart failure, and a new murmur are more suggestive of chordae tendineae rupture and acute mitral regurgitation.

Left ventricular free wall rupture (Choice D) is another potentially life-threatening complication of acute myocardial infarction caused by necrosis and inflammation leading to structural failure of the myocardium. Patients typically develop rapid hypotension, shock, and cardiac tamponade. The physical examination findings in this case are more suggestive of chordae tendineae rupture and acute mitral regurgitation.

Tricuspid valve insufficiency (Choice E) demonstrates a holosystolic murmur best heard in the left lower sternal border, and most commonly results from severe pulmonary hypertension or infective endocarditis in the setting of intravenous drug use.

Educational Objective: Severe mechanical complications of acute myocardial infarction include left ventricular free wall rupture, papillary muscle necrosis with rupture of the chordae tendineae, and rupture of the interventricular septum. Chordae tendineae rupture is associated with severe acute mitral regurgitation and consequent heart failure and pulmonary edema.

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13. A 17-year-old girl comes to the office for an examination required for sports participation. Medical history is unremarkable, and she takes no medications. She is 165 cm (5 ft 5 in) tall and weighs 54 kg (120 lb); BMI is 20 kg/m^2. At her last visit 1 year ago, BMI was 23 kg/m^2. The patient says she lost the weight by "eating healthy and exercising." She adds, "I would like to lose a little more weight." She began a vegetarian diet 6 weeks ago. Vital signs are normal with a pulse of 64/min; however, her pulse 1 year ago was 80/min. The remainder of the physical examination discloses no abnormalities. Which of the following is the most appropriate next step in management?

A) Admit the patient to an outpatient treatment program for eating disorders

B) Advise the patient to avoid losing any additional weight and schedule a follow-up examination in 1 month

C) Counsel the patient to stop exercising and refuse to sign her sports participation form until she returns in 1 week for a follow-up examination

D) Praise the patient for her healthy habits and encourage her to continue them

E) Recommend adding iron supplementation to the patient's vegetarian diet

Correct Answer: B.

This patient's decreasing BMI is likely attributable to dieting and excessive exercise. Weight dissatisfaction and consequent dieting are prevalent in adolescent populations. Complications of dieting include growth deceleration, nutritional deficiencies, eating disorders, and low self-esteem. Adolescents should be routinely screened for inappropriate dieting and encouraged to eat a nutritious and balanced diet rather than fasting or trying fad diets (eg, becoming vegetarian for the purpose of losing weight). Additionally, adolescents should be counseled to adhere to exercise guidelines (eg, 60 minutes daily) and educated about the benefits of exercise other than losing weight. Physicians should monitor for the complications of dieting during regular appointments.

Incorrect Answers: A, C, D, and E.

Admitting the patient to an outpatient treatment program for eating disorders (Choice A) would be appropriate if the patient met criteria for eating disorders such as anorexia nervosa, bulimia nervosa, or binge eating disorder. However, she does not demonstrate an abnormally low body weight for her age or endorse an intense fear of gaining weight, so she does not currently meet criteria for anorexia nervosa. As well, she does not demonstrate binge eating episodes or compensatory behaviors consistent with binge eating disorder or bulimia nervosa.

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E) Recommend adding iron supplementation to the patient's vegetarian diet

Correct Answer: B.

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Counseling the patient to stop exercising and refusing to sign her sports participation form until she returns in 1 week for a follow-up examination (Choice C) constitutes a paternalistic approach that is unlikely to inspire the patient to change her behavior. One week is not a long-enough time period to allow for a meaningful assessment of weight change.

Praising the patient for her healthy habits and encouraging her to continue them (Choice D) would be inappropriate. Inappropriate dieting is associated with harmful consequences such as growth deceleration, nutritional deficiencies, eating disorders, and low self-esteem.

Recommending iron supplementation to the patient's vegetarian diet (Choice E) may be ultimately indicated if the patient is unable to resume healthy eating habits. However, this patient should first be encouraged to discontinue dieting to prevent iron deficiency from developing.

Educational Objective: Weight dissatisfaction and dieting in adolescents can lead to harmful consequences such as eating disorders. Physicians should counsel these patients about healthy eating and exercise habits and monitor for harmful consequences of unhealthy eating during regular appointments.

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14. A 52-year-old man is brought to the emergency department by police 30 minutes after being found wandering in the park. On arrival, he appears confused and agitated. He is tremulous. He is 1 80 cm (5 ft 11 in) tall and weighs 59 kg (130 lb); BMI is 18 kg/m^2. His temperature is 37.8°C (100°F), pulse is 100/min, respirations are 16/min, and blood pressure is 150/90 mm Hg. Examination shows telangiectasias over the face and upper and lower extremities. The liver edge is palpated 4 cm below the right costal margin. Muscle bulk is decreased throughout; deep tendon reflexes are 3+ throughout. Babinski sign is absent. His gait is ataxic. On mental status examination, he refuses to answer any questions. Laboratory studies show:

Serum	
Na^+	135 mEq/L
K^+	3.5 mEq/L
Cl^-	93 mEq/L
Glucose	100 mg/dL
AST	90 U/L
ALT	65 U/L
Blood alcohol	90 mg/dL
Urine	positive for Δ^9-tetrahydrocannabinol

Intravenous administration of which of the following is the most appropriate next step in management to prevent Wernicke encephalopathy in this patient?

A) Dextrose followed by potassium and magnesium
B) Dextrose followed by vitamin B_1 (thiamine) and magnesium
C) Potassium and magnesium followed by 0.9% saline
D) Vitamin B_1 (thiamine)
E) Vitamin B_{12} (cyanocobalamin) and potassium followed by 0.9% saline

Correct Answer: D.

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C) Potassium and magnesium followed by 0.9% saline
D) Vitamin B_1 (thiamine)
E) Vitamin B_{12} (cyanocobalamin) and potassium followed by 0.9% saline

Correct Answer: D.

Patients who chronically abuse alcohol typically develop a significant thiamine (vitamin B_1) deficiency caused by poor nutritional intake, thiamine malabsorption, and impaired cellular utilization of thiamine. Over time, thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. Though potentially intoxicated (blood alcohol is 90 mg/dL), this patient demonstrates evidence of chronic alcohol abuse (increased transaminases, ataxia, confusion, increased liver span, telangiectasias). The typical clinical presentation of Wernicke encephalopathy is a triad of acute altered mental status (eg, disorientation), ophthalmoplegia/nystagmus, and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome (also known as Korsakoff psychosis) in chronic alcohol users if not immediately treated with high-dose intravenous thiamine therapy. Wernicke-Korsakoff syndrome is an irreversible condition that features anterograde and retrograde amnesia along with the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember. Intravenous vitamin B_1 (thiamine) should be administered immediately to prevent the progression to Wernicke-Korsakoff syndrome.

Incorrect Answers: A, B, C, and E.

Dextrose followed by potassium and magnesium (Choice A) might be appropriate if this patient were hypoglycemic, however his glucose was within normal range. Since he demonstrates classic signs of Wernicke encephalopathy, immediate administration of thiamine should be prioritized.

Dextrose followed by vitamin B_1 (thiamine) and magnesium (Choice B) risks provoking a theoretical Wernicke crisis because administration of dextrose before thiamine can result in additional relative thiamine deficiency within the enzymes of glycolysis and the tricarboxylic acid cycle.

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Patients who chronically abuse alcohol typically develop a significant thiamine (vitamin B_1) deficiency caused by poor nutritional intake, thiamine malabsorption, and impaired cellular utilization of thiamine. Over time, thiamine deficiency can result in damage and atrophy of the mammillary bodies, visible on MRI of the brain, which manifests as Wernicke encephalopathy. Though potentially intoxicated (blood alcohol is 90 mg/dL), this patient demonstrates evidence of chronic alcohol abuse (increased transaminases, ataxia, confusion, increased liver span, telangiectasias). The typical clinical presentation of Wernicke encephalopathy is a triad of acute altered mental status (eg, disorientation), ophthalmoplegia/nystagmus, and ataxia. The symptoms of Wernicke encephalopathy are reversible but increase the risk for developing Wernicke-Korsakoff syndrome (also known as Korsakoff psychosis) in chronic alcohol users if not immediately treated with high-dose intravenous thiamine therapy. Wernicke-Korsakoff syndrome is an irreversible condition that features anterograde and retrograde amnesia along with the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember. Intravenous vitamin B_1 (thiamine) should be administered immediately to prevent the progression to Wernicke-Korsakoff syndrome.

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Dextrose followed by vitamin B_1 (thiamine) and magnesium (Choice B) risks provoking a theoretical Wernicke crisis because administration of dextrose before thiamine can result in additional relative thiamine deficiency within the enzymes of glycolysis and the tricarboxylic acid cycle.

Potassium and magnesium followed by 0.9% saline (Choice C) may support this patient with likely dehydration and metabolic deficiencies, though high dose intravenous thiamine takes priority in the treatment of Wernicke encephalopathy.

Vitamin B_{12} (cyanocobalamin) and potassium followed by 0.9% saline (Choice E) would be an appropriate choice if the patient showed signs of subacute combined degeneration, however his presentation is likely more related to thiamine deficiency because of the presence of confusion and signs of chronic alcohol abuse.

Educational Objective: Chronic alcohol abuse and associated malnutrition may result in significant thiamine deficiency, which can lead to Wernicke encephalopathy. Wernicke encephalopathy is a triad of acute altered mental status, ophthalmoplegia/nystagmus, and ataxia. Thiamine therapy should be administered immediately to prevent the progression to Wernicke-Korsakoff syndrome, an irreversible dementia syndrome.

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15. A 35-year-old man with Crohn disease returns to the clinic for follow-up 4 months after undergoing uncomplicated surgical repair of an enterovesical fistula. Medical history otherwise is unremarkable. Trials of 5-aminosalicylic acid, azathioprine, and prednisone prescribed since diagnosis 2 years ago have not controlled his Crohn disease; his only current medication is a daily multivitamin. He has smoked one pack of cigarettes daily for 15 years and occasionally drinks alcoholic beverages. The patient is 180 cm (5 ft 11 in) tall and weighs 68 kg (150 lb); BMI is 21 kg/m^2. Temperature is 37.2°C (99.0°F), pulse is 85/min and regular, respirations are 16/min, and blood pressure is 114/68 mm Hg. Lungs are clear to auscultation. Cardiac examination discloses a grade 1/6 systolic ejection murmur heard best at the upper right sternal border. Abdominal examination shows a well-healed surgical scar. Bowel sounds are normal. There is no tenderness to palpation or percussion of the abdomen. Infliximab therapy is initiated. Which of the following studies is most appropriate to obtain at follow-up examination in 1 month?

A) Chest x-ray
B) Complete blood count
C) Echocardiography
D) Liver function tests
E) Measurement of serum urea nitrogen and creatinine concentrations

Correct Answer: B.

In this patient with severe Crohn's disease who is being treated with azathioprine and infliximab, a complete blood count is the most appropriate study to obtain in 1 month. Infliximab is a monoclonal antibody that targets soluble TNF-α to prevent effective binding with the TNF-α receptor. It is used in the treatment of autoimmune disorders such as Crohn disease, ulcerative colitis, rheumatoid arthritis, ankylosing spondylitis, psoriasis, and Behçet disease. Anemia is a common adverse effect of infliximab occurring in approximately 10% of cases. Risk for infection, particularly mycobacterial infection, is increased because of the inhibition of TNF-α and prevention of granuloma formation. Azathioprine is a mercaptopurine derivative which causes immunosuppression by blocking purine synthesis and incorporating into DNA to prevent further replication. A potential adverse effect of azathioprine is pancytopenia. Because of the known hematologic adverse effects of infliximab and azathioprine, this patient should have a complete blood count checked 1 month after adding infliximab to his treatment regimen.

Incorrect Answers: A, C, D, and E.

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Incorrect Answers: A, C, D, and E.

Chest x-ray (Choice A) is not needed after starting infliximab. Use of TNF-α blocking medications does increase the risk for reactivation of latent tuberculosis, but this is not monitored by chest x-ray. Instead, a tuberculin skin test or serum interferon gamma release assay should be checked prior to starting a TNF-α inhibitor so as not to reactivate latent tuberculosis.

Echocardiography (Choice C) is not indicated as a routine screening test after initiating infliximab. If the patient were to develop signs of heart failure, then echocardiography would be warranted, but it is not performed routinely.

Liver function tests (Choice D) may be monitored while receiving infliximab infusions but are less critical than a complete blood count. As with mycobacterial infections, infliximab may reactivate latent hepatitis B. Thus, prior to starting infliximab, hepatitis screening should be completed in all patients.

Measurement of serum urea nitrogen and creatinine concentrations (Choice E) is not necessary in the monitoring of patients on infliximab. Infliximab does not typically cause renal dysfunction. It may increase the likelihood of urinary tract infections, but this is addressed only on a symptomatic basis.

Educational Objective: Infliximab is a monoclonal antibody that targets soluble TNF-α to prevent binding with the TNF-α receptor. It is used in the treatment of autoimmune disorders such as Crohn disease, ulcerative colitis, rheumatoid arthritis, ankylosing spondylitis, psoriasis, and Behçet disease. Anemia is a potential adverse effect of infliximab, thus checking a complete blood count 1 month after initiating treatment is warranted. Prior to initiating infliximab, it is critical to rule out latent tuberculosis, hepatitis B, or hepatitis C infections.

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16. A researcher conducts a randomized controlled trial of a new drug to treat chronic hepatitis B infection. A total of 400 patients are needed in order to detect a 10% difference in remission rates between the study drug and standard treatment groups. The researcher sets an α level of 0.05 and a β level of 0.20. A total of 500 patients are enrolled in the study, and 480 complete it. Patients are monitored for adverse events and for remission of the disease. The results are shown:

	Study Drug Group, %	Standard Treatment Group, %	*P*-value
Remission rate	20	10	.12
Adverse event rate	10	6	.07

Which of the following is the most likely cause of the lack of difference in the adverse event rate?

A) Lack of clinical response to the study drug
B) More patients than needed were enrolled in the study
C) Number of patients lost to follow-up
D) Type I error
E) Type II error

Correct Answer: E.

The most likely cause of the lack of difference in the adverse event rate between the two groups is a type II error. When conducting any experiment, two hypotheses are created. The null hypothesis, or H_0, states that there is no difference between the groups being compared. The alternative hypothesis, or H_1, suggests that there is a difference between the groups being compared. A type II error occurs when a study demonstrates no difference between the null and alternative hypotheses, when in fact, a difference exists. It is known as a 'false negative' error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements. The β level is set by the investigators and represents the likelihood that a type II error will be committed. In this case, the β level is set at 0.20, or 20%, so there is a 20% chance that the study drug group and standard treatment group are significantly different from each other in their adverse event rate but that the study did not identify this difference.

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The most likely cause of the lack of difference in the adverse event rate between the two groups is a type II error. When conducting any experiment, two hypotheses are created. The null hypothesis, or H_0, states that there is no difference between the groups being compared. The alternative hypothesis, or H_1, suggests that there is a difference between the groups being compared. A type II error occurs when a study demonstrates no difference between the null and alternative hypotheses, when in fact, a difference exists. It is known as a 'false negative' error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements. The β level is set by the investigators and represents the likelihood that a type II error will be committed. In this case, the β level is set at 0.20, or 20%, so there is a 20% chance that the study drug group and standard treatment group are significantly different from each other in their adverse event rate but that the study did not identify this difference.

Incorrect Answers: A, B, C, and D.

Based on this study, it cannot be definitely stated that there is a lack of clinical response to the study drug (Choice A). The comparisons between the two groups do not achieve statistical significance but do approach it, which might suggest that there is a clinical response difference between the two groups but that the power of the study to detect it is inadequate.

More patients than needed were enrolled in the study (Choice B) is incorrect and, in fact, the opposite is true. The rate of a type II error, or β level, is a function of 1- power. As power increases, which is most often achieved by increasing sample size, β level decreases. Thus, it is more likely that fewer patients than needed were enrolled in the study to detect a difference between the two groups.

Number of patients lost to follow-up (Choice C) in this case was twenty, which equates to fewer than 5% of the original participants. This alone is not likely to cause a type II error to occur.

Type I error (Choice D) is the likelihood of erroneously rejecting the null hypothesis (concluding that the alternative hypothesis is true). The probability of this error is set at the alpha level. However, because the authors did not conclude that there was a difference between the two groups, they did not reject the null hypothesis and thus a type I error could not have been committed.

Educational Objective: A type II error occurs when a study demonstrates no difference between the null and alternative hypotheses, when in fact, a difference exists. It is known as a 'false negative' error and can be reduced by increasing the power of the study through a larger sample size and increasing precision in measurements.

https://t.me/USMLENBME2CK

17. A 13-year-old boy is brought to the office because of a 2-week history of a painless mass in the right thigh. He noticed the mass after a teammate hit him in the same area during a soccer game. He has not had weight loss, fatigue, or fever. He has no history of serious illness and takes no medications. Vital signs are within normal limits. Cardiopulmonary examination shows no abnormalities. Examination of the anterior aspect of the right thigh shows a 5-cm firm, nontender mass. Range of motion of the right knee is full and does not produce pain. Femoral and distal pulses are palpable. Sensation is intact. MRI of the right thigh shows a soft-tissue mass in the anterior compartment that is not adjacent to major arteries or nerves. An incisional biopsy specimen shows moderate-grade fibrosarcoma. Which of the following studies is the most appropriate next step in management?

A) CT scan of the chest and abdomen
B) ECG
C) Femoral arteriography
D) Genetic testing
E) Ultrasonography of the scrotum

Correct Answer: A.

The next step in the management of this patient with fibrosarcoma is to perform a CT scan of the chest and abdomen. Soft tissue sarcomas, which includes fibrosarcoma, are a heterogenous group of tumors derived from mesenchymal tissue such as skeletal or smooth muscle, adipose, or fibrous tissue. Malignant fibrous histiocytoma, now commonly referred to as undifferentiated pleomorphic sarcoma, is the most common type of soft tissue sarcoma. A gradually enlarging, painless mass within an extremity is the most common presentation of soft tissue sarcomas but they can develop in any location. In areas such as the thigh or retroperitoneum, the tumors can become very large prior to presentation. Metastasis is possible and tends to occur through hematogenous spread rather than lymphatic spread. Because of this, all patients with an initial diagnosis of soft tissue sarcoma should undergo evaluation for distant spread. CT scan of the chest evaluates for pulmonary spread, which is common because of the tumor's hematogenous method of metastasis, and CT scan of the abdomen evaluates for extrapulmonary metastases to the abdomen, pelvis, and retroperitoneum. With the information provided by the initial examination and the imaging, the stage of a soft tissue sarcoma is determined using the TNM staging system. Treatment of soft tissue sarcoma is based on tumor stage and includes both surgical and systemic therapies.

Incorrect Answers: B, C, D, and E.

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Incorrect Answers: B, C, D, and E.

ECG (Choice B) is not indicated as there is no evidence of cardiac disease in this patient. Depending on whether chemotherapy is necessary and which type is chosen, an ECG may be performed at baseline. For example, patients undergoing chemotherapy with cardiotoxic agents like doxorubicin or daunorubicin will have baseline cardiac testing.

Femoral arteriography (Choice C) is not necessary in this patient as his femoral pulse is intact and the mass appears to be more anterior anatomically than the course of the femoral artery. If it is necessary for surgical planning, then it would be performed after imaging to evaluate for metastatic disease.

For some tumors, genetic testing (Choice D) is utilized to guide treatment. For example, melanoma which is positive for a V600E mutation in the BRAF gene responds to vemurafenib, a small molecule inhibitor. However, this genetic testing is not routinely used in the management of soft tissue sarcoma. Evaluation for metastases is a more important next step in the management of this patient.

Ultrasonography of the scrotum (Choice E) is not necessary in the evaluation of this fibrosarcoma. While imaging of the chest, abdomen, and pelvis is warranted to evaluate for metastases, imaging of the scrotum is not needed.

Educational Objective: A gradually enlarging, painless mass within an extremity should raise concern for the presence of a soft tissue sarcoma. After the pathologic diagnosis has been confirmed, imaging should be performed to investigate whether metastatic disease is present. This information aids in staging and treatment planning.

https://t.me/USMLENBME2CK

18. A 17-year-old boy comes to the urgent treatment center because of a 4-day history of abdominal pain, loss of appetite, nausea, chills, and fever, which has responded to acetaminophen. He has not had headache, ear pain, or sore throat. He is able to tolerate fluids, but eating solid food increases his abdominal pain. Medical history is remarkable for seasonal allergies and lactose intolerance. His only routine medication is as-needed loratadine. He does not drink alcoholic beverages or use illicit drugs. He is monogamous with his girlfriend and engages in oral sex only. He returned home from a trip to Mexico with his family 3 weeks ago. Temperature is 37.8°C (100.0°F), pulse is 86/min, respirations are 14/min, and blood pressure is 100/60 mm Hg. The patient appears jaundiced. There is abdominal tenderness in the right upper quadrant without rebound or guarding. Murphy sign is absent. Results of which of the following serologic studies are most likely to confirm the diagnosis?

A) Hepatitis A IgG
B) Hepatitis A IgM
C) Hepatitis B IgM
D) Hepatitis B surface antigen
E) Hepatitis C IgG

Correct Answer: B.

Hepatitis A virus (HAV) is a common cause of food poisoning and traveler's diarrhea among travelers in the developing world. HAV is a non-enveloped, single stranded RNA virus that is spread through fecal-oral transmission. It is commonly acquired through the ingestion of poorly cooked, improperly handled, or raw foods. Presenting signs and symptoms include fever, nausea, vomiting, poor appetite, abdominal pain, jaundice, and hepatomegaly, although many patients are asymptomatic. Laboratory findings include transaminitis, increased alkaline phosphatase, hyperbilirubinemia, and bilirubinuria. Liver biopsy is not routinely required but may demonstrate ballooning hepatocyte degeneration and Councilman bodies. In patients who have been recently exposed to hepatitis A virus, IgM antibodies against the virus are most likely to confirm the diagnosis. The hepatitis A vaccine provides long-lasting protection against infection with HAV and is recommended to all travelers to endemic areas. The HAV vaccine is an inactivated vaccine and is given through intramuscular injection in a series of two injections.

Incorrect Answers: A, C, D, and E.

Hepatitis A IgG (Choice A) develops in hepatitis A infection several weeks after IgM and may not be present for 4 to 6 weeks following the initial symptoms. This patient

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E) Hepatitis C IgG

Correct Answer: B.

Hepatitis A virus (HAV) is a common cause of food poisoning and traveler's diarrhea among travelers in the developing world. HAV is a non-enveloped, single stranded RNA virus that is spread through fecal-oral transmission. It is commonly acquired through the ingestion of poorly cooked, improperly handled, or raw foods. Presenting signs and symptoms include fever, nausea, vomiting, poor appetite, abdominal pain, jaundice, and hepatomegaly, although many patients are asymptomatic. Laboratory findings include transaminitis, increased alkaline phosphatase, hyperbilirubinemia, and bilirubinuria. Liver biopsy is not routinely required but may demonstrate ballooning hepatocyte degeneration and Councilman bodies. In patients who have been recently exposed to hepatitis A virus, IgM antibodies against the virus are most likely to confirm the diagnosis. The hepatitis A vaccine provides long-lasting protection against infection with HAV and is recommended to all travelers to endemic areas. The HAV vaccine is an inactivated vaccine and is given through intramuscular injection in a series of two injections.

Incorrect Answers: A, C, D, and E.

Hepatitis A IgG (Choice A) develops in hepatitis A infection several weeks after IgM, and may not be present for 4 to 6 weeks following the initial exposure. This patient was exposed to hepatitis A approximately 3 weeks ago and is more likely to display IgM than IgG antibodies.

Hepatitis B IgM (Choice C) and hepatitis B surface antigen (Choice D) are both found in the setting of acute hepatitis B virus (HBV) exposure. Hepatitis B is transmitted through blood, sexual contact, or perinatally. Chronic infection can lead to cirrhosis and hepatocellular carcinoma. Vaccination against hepatitis B is commonly administered to newborns, although it can also be given in adulthood and is recommended for healthcare workers, injection drug users, men who have sex with men, and patients with HIV or hepatitis C. This patient lacks significant risk factors for HBV exposure. HBV is rarely transmitted through oral sex.

Hepatitis C IgG (Choice E) is positive in patients who have been exposed to hepatitis C virus (HCV). HCV is an RNA virus that is acquired through exposure to contaminated blood and is more likely to occur in intravenous drug users who utilize nonsterile needles or share needles with others. HCV can cause a self-limited acute infection, but may lead to chronic infection, which is often asymptomatic. HCV can usually now be cured with the use of combination antivirals.

Educational Objective: Hepatitis A virus is a common cause of food poisoning and traveler's diarrhea among travelers in the developing world. In patients who have been recently exposed to hepatitis A virus, IgM antibodies against the virus are most likely to confirm the diagnosis. Vaccination against hepatitis A virus is recommended to all travelers who visit countries in the developing world.

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19. Screening for colon cancer is started in patients at the age of 45 years instead of at the age of 50 years. Which of the following is the most likely effect on the predictive values?

	Positive Predictive Value	Negative Predictive Value
A)	Decrease	decrease
B)	Decrease	increase
C)	Decrease	no change
D)	Increase	decrease
E)	Increase	increase
F)	Increase	no change
G)	No change	decrease
H)	No change	increase
I)	No change	no change

Correct Answer: B.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Sensitivity is the ability of a test to detect a disease if it is present and is equivalent to the true positive rate. Sensitivity = true positives (TP)/(TP + false negatives (FN)). High sensitivity is therefore useful in ruling out a disease. A test is described as specific if it has a low false-positive rate. Specificity = true negatives (TN)/(TN + false positives (FP)). Positive predictive value is based on both a test's specificity and the pretest probability of disease. Positive predictive value is the likelihood that a person has a disease given a positive test. PPV = (TP)/(TP + FP). Negative predictive value is based on both the test's sensitivity and the pretest probability of the patient having the disease. NPV = TN/(TN + FN). In this scenario, the age at which colon cancer screening is started has decreased. Because colon cancer is rare in men under age 50, the pretest probability is low and this change will likely lead to the detection of relatively few cancers (TP), while leading to an increase in the number of measured TN and FP. Given that PPV = (TP)/(TP + FP), an increase in

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H)	No change	increase
I)	No change	no change

Correct Answer: B.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Sensitivity is the ability of a test to detect a disease if it is present and is equivalent to the true positive rate. Sensitivity = true positives (TP)/(TP + false negatives (FN)). High sensitivity is therefore useful in ruling out a disease. A test is described as specific if it has a low false-positive rate. Specificity = true negatives (TN)/(TN + false positives (FP)). Positive predictive value is based on both a test's specificity and the pretest probability of disease. Positive predictive value is the likelihood that a person has a disease given a positive test. PPV = (TP)/(TP + FP). Negative predictive value is based on both the test's sensitivity and the pretest probability of the patient having the disease. NPV = TN/(TN + FN). In this scenario, the age at which colon cancer screening is started has decreased. Because colon cancer is rare in men under age 50, the pretest probability is low and this change will likely lead to the detection of relatively few cancers (TP), while leading to an increase in the number of measured TN and FP. Given that PPV = (TP)/(TP + FP), an increase in FP will lead to a decrease in PPV. Similarly, given that NPV = TN/(TN + FN), an increase in TN will lead to an increase in NPV.

Incorrect Answers: A, C, D, E, F, G, H, and I.

Choices A and C are also characterized by a decrease in PPV. However, NPV is expected to decrease, rather than increase or stay the same because screening for colon cancer in younger patients will lead to an increase in TN.

Choices D, E, and F are characterized by an increase in PPV. An increased PPV requires either an increase in TP or a decrease in FP. The rates of TP and FP are dependent on the inherent sensitivity of the test and the pretest probability of the patient having the disease. Applying the test only in patients with a high pretest probability could increase the TP rate and decrease the FP rate. This could be accomplished by restricting the test only to older patients rather than younger patients.

Choices G, H, and I are all characterized by a lack of change in PPV. In general, the broader application of a test to a population with a lower pretest probability will inevitably result in an increase in FP, and therefore a decrease in PPV.

Educational Objective: Positive predictive value is based on both test specificity and the pretest probability of disease. Positive predictive value is the likelihood that a person has a disease, given a positive test, and is calculated as PPV = (TP)/(TP + FP). Negative predictive value is based on both the test sensitivity and the pretest probability of the patient having the disease and is calculated as NPV = TN/(TN + FN). The application of a test in a population with a lower pretest probability will result in an increase in both true negatives and false positives, with a resultant decrease in PPV and an increase in NPV.

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I)	No change	no change	

Correct Answer: B.

The quality of a diagnostic test is measured by its sensitivity, specificity, positive predictive value, and negative predictive value. Sensitivity is the ability of a test to detect a disease if it is present and is equivalent to the true positive rate. Sensitivity = true positives (TP)/(TP + false negatives (FN)). High sensitivity is therefore useful in ruling out a disease. A test is described as specific if it has a low false-positive rate. Specificity = true negatives (TN)/(TN + false positives (FP)). Positive predictive value is based on both a test's specificity and the pretest probability of disease. Positive predictive value is the likelihood that a person has a disease given a positive test. PPV = (TP)/(TP + FP). Negative predictive value is based on both the test's sensitivity and the pretest probability of the patient having the disease. NPV = TN/(TN + FN). In this scenario, the age at which colon cancer screening is started has decreased. Because colon cancer is rare in men under age 50, the pretest probability is low and this change will likely lead to the detection of relatively few cancers (TP), while leading to an increase in the number of measured TN and FP. Given that PPV = (TP)/(TP + FP), an increase in FP will lead to a decrease in PPV. Similarly, given that NPV = TN/(TN + FN), an increase in TN will lead to an increase in NPV.

Incorrect Answers: A, C, D, E, F, G, H, and I.

Choices A and C are also characterized by a decrease in PPV. However, NPV is expected to decrease, rather than increase or stay the same because screening for colon cancer in younger patients will lead to an increase in TN.

Choices D, E, and F are characterized by an increase in PPV. An increased PPV requires either an increase in TP or a decrease in FP. The rates of TP and FP are dependent on the inherent sensitivity of the test and the pretest probability of the patient having the disease. Applying the test only in patients with a high pretest probability could increase the TP rate and decrease the FP rate. This could be accomplished by restricting the test only to older patients rather than younger patients.

Choices G, H, and I are all characterized by a lack of change in PPV. In general, the broader application of a test to a population with a lower pretest probability will inevitably result in an increase in FP, and therefore a decrease in PPV.

Educational Objective: Positive predictive value is based on both test specificity and the pretest probability of disease. Positive predictive value is the likelihood that a person has a disease, given a positive test, and is calculated as PPV = (TP)/(TP + FP). Negative predictive value is based on both the test sensitivity and the pretest probability of the patient having the disease and is calculated as NPV = TN/(TN + FN). The application of a test in a population with a lower pretest probability will result in an increase in both true negatives and false positives, with a resultant decrease in PPV and an increase in NPV.

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20. A 42-year-old man comes to the physician because of a 1-year history of chronic nosebleeds. He also had an episode of hematuria 3 months ago. His older brother has similar bleeding problems. Examination shows no abnormalities. Laboratory studies show:

Hemoglobin	13.7 g/dL
Leukocyte count	8000/mm^3
Platelet count	280,000/mm^3
Bleeding time	15 min
Prothrombin time	11 sec (INR=1.0)
Partial thromboplastin time	45 sec

Test of the stool for occult blood is positive. Urinalysis shows no abnormalities. Which of the following is the most likely diagnosis?

A) Antiphospholipid antibody syndrome
B) Antithrombin III deficiency
C) Disseminated intravascular coagulation
D) Factor XI deficiency
E) Hemophilia
F) Henoch-Schönlein purpura
G) Vitamin K deficiency
H) von Willebrand disease

Correct Answer: H.

The most likely diagnosis in this patient with chronic nosebleeds and an isolated increase in partial thromboplastin time (PTT) is von Willebrand disease (VWD), a common coagulopathy affecting platelet qualitative function. VWD results from impairments in the amount or function of the von Willebrand protein multimer, a plasma protein that

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C) Disseminated intravascular coagulation
D) Factor XI deficiency
E) Hemophilia
F) Henoch-Schönlein purpura
G) Vitamin K deficiency
H) von Willebrand disease

Correct Answer: H.

The most likely diagnosis in this patient with chronic nosebleeds and an isolated increase in partial thromboplastin time (PTT) is von Willebrand disease (VWD), a common coagulopathy affecting platelet qualitative function. VWD results from impairments in the amount or function of the von Willebrand protein multimer, a plasma protein that binds platelets to subendothelial collagen. The deficiency results in impaired hemostasis, generally involving mucosal and epithelial locations, caused by deficiency of platelet adhesion. VWD can be genetic (likely in this case given his affected brother) or acquired. Because the von Willebrand multimer also acts as a serum transport protein for coagulation factor VIII, factor VIII concentrations may be decreased, leading to the increase in PTT without affecting the prothrombin time (PT). Patients often present with recurrent nosebleeds, easy bruising, petechiae, menorrhagia, gastrointestinal, and gingival bleeding. Unless blood loss is substantial, laboratory studies will otherwise be normal. Mild VWD is generally asymptomatic, although moderate or severe deficiency can result in transfusion-dependent anemia, unabating hemorrhage, and shock. Treatment, in addition to supportive care with bleeding control and transfusions, may involve the administration of desmopressin.

Incorrect Answers: A, B, C, D, E, F, and G.

Antiphospholipid antibody syndrome (Choice A) often presents with hypercoagulability, not coagulopathy. It is associated with systemic lupus erythematosus and is a frequent cause of recurrent miscarriage.

Antithrombin III deficiency (Choice B) presents with hypercoagulability caused by deficient antithrombin III and can be genetic or acquired. It is associated with nephrotic syndrome, hypothesized to be caused by the protein loss over the impaired glomerular barrier.

Disseminated intravascular coagulation (Choice C) presents with derangements in both platelet and factor concentrations, and generally with hemolytic anemia. Laboratory studies show increased PTT and PT with a decreased fibrinogen concentration. It often arises in the context of severe infection and critical illness.

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otherwise be normal. Mild VWD is generally asymptomatic, although moderate or severe deficiency can result in transfusion-dependent anemia, unabating hemorrhage, and shock. Treatment, in addition to supportive care with bleeding control and transfusions, may involve the administration of desmopressin.

Incorrect Answers: A, B, C, D, E, F, and G.

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Antithrombin III deficiency (Choice B) presents with hypercoagulability caused by deficient antithrombin III and can be genetic or acquired. It is associated with nephrotic syndrome, hypothesized to be caused by the protein loss over the impaired glomerular barrier.

Disseminated intravascular coagulation (Choice C) presents with derangements in both platelet and factor concentrations, and generally with hemolytic anemia. Laboratory studies show increased PTT and PT with a decreased fibrinogen concentration. It often arises in the context of severe infection and critical illness.

Factor XI deficiency (Choice D) is an uncommon coagulopathy caused by genetic or acquired quantitative or qualitative compromise of factor XI. It may result in bleeding, however bleeding associated with factor deficiency more commonly occurs in visceral locations. Similarly, hemophilia (Choice E) would present with visceral bleeding (eg, splenic hemorrhage, rectus sheath hematoma, hemarthrosis).

Henoch-Schönlein purpura (Choice F) is a vasculitis that results in purpura, arthralgias, and gastrointestinal plus renal involvement, generally in children. It would be uncommon in an adult male.

Vitamin K deficiency (Choice G) presents with increased PT and PTT caused by insufficient hepatic synthesis of coagulation factors. This patient has a normal PT and no indication of dietary deficiency of vitamin K, which is rare outside of infancy.

Educational Objective: Von Willebrand disease results from impairments in the amount or function of the von Willebrand protein multimer, a plasma protein that binds platelets to subendothelial collagen. The deficiency results in impaired hemostasis, generally involving mucosal and epithelial locations, caused by deficiency of platelet adhesion. The platelet count is generally normal, and the partial thromboplastin time is increased because of the protein's role in shuttling factor VIII in plasma. Treatment includes supportive care plus supplemental desmopressin and/or recombinant factor.

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21. A 23-year-old woman comes to the physician because of a 2-day history of several small, painful lesions over the vulva. She has no history of medical or gynecologic illness. She has a history of six lifetime sexual partners and became sexually active with her current partner 6 weeks ago; she uses condoms inconsistently. Examination shows ulcerations over the external genitalia that are tender to touch. She is concerned that she might have a sexually transmitted disease and that this might endanger future pregnancies. This patient should be advised that she is at increased risk for which of the following pregnancy outcomes?

A) Chorioamnionitis
B) Fetal growth restriction
C) Fetal malformations
D) Intrapartum transmission of the infection
E) Premature rupture of membranes

Correct Answer: D.

Herpes simplex virus (HSV) genital infection is characterized by painful vesicles in the genital area (eg, vulva, vagina, cervix, perineum) and may be associated with pain during urination. Most cases of genital herpes are caused by HSV-2; however, HSV-1 has also been associated with genital herpes infection. It typically begins with the formation of vesicles, which lyse and progress to shallow, painful ulcers with an erythematous border. This painful rash can be exacerbated during urination, in which acidic urine passes over open vesicles or ulcers. Other symptoms include fever, chills, and inguinal lymphadenopathy. In pregnant patients, the infection may pass to a neonate during delivery secondary to an ascending infection following spontaneous rupture of membranes or from passage through the infected lower genital tract. To prevent this intrapartum transmission of infection, acyclovir can be used to suppress outbreaks. A cesarean delivery is required if herpetic lesions or symptoms are present on the cervix, vagina, or vulva at the time of labor. Common neonatal complications include vesicular skin lesions and ocular involvement, while neonatal encephalitis is a potential severe complication of the infection.

Incorrect Answers: A, B, C, and E.

Chorioamnionitis (Choice A) is a bacterial infection of the fetal membranes and commonly occurs in the setting of premature or prolonged rupture of membranes. Maternal

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during urination. Most cases of genital herpes are caused by HSV-2; however, HSV-1 has also been associated with genital herpes infection. It typically begins with the formation of vesicles, which lyse and progress to shallow, painful ulcers with an erythematous border. This painful rash can be exacerbated during urination, in which acidic urine passes over open vesicles or ulcers. Other symptoms include fever, chills, and inguinal lymphadenopathy. In pregnant patients, the infection may pass to a neonate during delivery secondary to an ascending infection following spontaneous rupture of membranes or from passage through the infected lower genital tract. To prevent this intrapartum transmission of infection, acyclovir can be used to suppress outbreaks. A cesarean delivery is required if herpetic lesions or symptoms are present on the cervix, vagina, or vulva at the time of labor. Common neonatal complications include vesicular skin lesions and ocular involvement, while neonatal encephalitis is a potential severe complication of the infection.

Incorrect Answers: A, B, C, and E.

Chorioamnionitis (Choice A) is a bacterial infection of the fetal membranes and commonly occurs in the setting of premature or prolonged rupture of membranes. Maternal fever and leukocytosis are characteristic, and the uterus may be tender to palpation. A fetal heart tracing may also demonstrate tachycardia caused by the maternal fever. It is not caused by the herpes simplex virus.

Fetal growth restriction (Choice B) may be identified by a smaller than expected fundal height, a fetus that is below the 10th percentile of weight for its gestational age, and oligohydramnios. The fetus may also have an increased head to abdominal circumference ratio in cases of asymmetric fetal growth restriction. It is not a known complication of maternal herpes simplex infection.

Fetal malformations (Choice C) can be caused by chromosomal or genetic abnormalities, in addition to errors in embryonic development. Maternal herpes simplex infection does not cause fetal malformations; rather, it can cause fetal infection if the newborn comes into contact with herpetic lesions during delivery.

Premature rupture of membranes (Choice E) refers to rupture of the amniotic membrane prior to the onset of labor. Symptoms include a painless gush or leakage of fluid. Diagnosis can be made with the observation of vaginal fluid pooling, nitrazine testing, ferning, or by detection of fetal fibronectin or α-fetoprotein. It is not a complication associated with maternal herpes simplex infection.

Educational Objective: Herpes simplex virus causes vesicular lesions on the vulva, vagina, perineum, or rectum, which progress to shallow, painful ulcers. Infection in a pregnant patient can spread to the infant during delivery through ascension through ruptured membranes or during fetal descent through the vaginal canal. Infection of the fetus can lead to vesicular skin lesions, ocular involvement, and/or encephalitis.

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22. A 62-year-old woman comes to the physician because of a 6-month history of increasing pain in her right thumb, especially with use. She now has difficulty with daily activities such as opening jars. She is right-handed. Ten years ago, she received the diagnosis of breast cancer and underwent mastectomy followed by chemotherapy. Evaluation 2 years ago showed no evidence of recurrence. She has type 2 diabetes mellitus controlled with metformin. Examination shows severe tenderness to palpation at the base of the right thumb. Muscle strength is 3/5 on abduction of the thumb due to pain. Sensation to pinprick is intact over the thumb. Which of the following is the most likely diagnosis?

A) Bony metastases
B) Carpal tunnel syndrome
C) Cervical radiculopathy
D) Degenerative joint disease
E) Diabetic neuropathy

Correct Answer: D.

Degenerative joint disease, or osteoarthritis, is caused by the repetitive use of a particular joint over time, which leads to inflammation of the joint and cartilage degradation with consequent joint pain. With ongoing osteoarthritis, subchondral bone sclerosis and bone cysts can also develop. Physical examination may disclose a limited range of motion, swelling, tenderness to palpation, and joint instability (especially in the knees or hips). The most commonly affected joints are the interphalangeal joints, first carpometacarpal and metatarsophalangeal joints, knees, hips, and facet joints of the spine. Risk factors for its development include age, obesity, and prior intra-articular injury. X-rays are often used if the diagnosis is uncertain, with typical findings including joint space narrowing, marginal osteophytes, and subchondral sclerosis or bone cysts. Management options include physical therapy, braces, weight loss, acetaminophen, intra-articular steroid injections, and if severe, joint replacement.

Incorrect Answers: A, B, C, and E.

Bony metastases (Choice A) are most commonly caused by prostate, breast, lung, kidney, and thyroid cancers. Many of these lesions are asymptomatic but usually present with focal pain if symptomatic. Bony metastases most commonly occur in the skull, axial skeleton, or the medullary portion of the appendicular skeleton. They are unlikely to present solely with thumb pain.

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Degenerative joint disease, or osteoarthritis, is caused by the repetitive use of a particular joint over time, which leads to inflammation of the joint and cartilage degradation with consequent joint pain. With ongoing osteoarthritis, subchondral bone sclerosis and bone cysts can also develop. Physical examination may disclose a limited range of motion, swelling, tenderness to palpation, and joint instability (especially in the knees or hips). The most commonly affected joints are the interphalangeal joints, first carpometacarpal and metatarsophalangeal joints, knees, hips, and facet joints of the spine. Risk factors for its development include age, obesity, and prior intra-articular injury. X-rays are often used if the diagnosis is uncertain, with typical findings including joint space narrowing, marginal osteophytes, and subchondral sclerosis or bone cysts. Management options include physical therapy, braces, weight loss, acetaminophen, intra-articular steroid injections, and if severe, joint replacement.

Incorrect Answers: A, B, C, and E.

Bony metastases (Choice A) are most commonly caused by prostate, breast, lung, kidney, and thyroid cancers. Many of these lesions are asymptomatic but usually present with focal pain if symptomatic. Bony metastases most commonly occur in the skull, axial skeleton, or the medullary portion of the appendicular skeleton. They are unlikely to present solely with thumb pain.

Carpal tunnel syndrome (Choice B) presents with numbness and tingling of the first three fingers caused by compression of the median nerve in the carpal tunnel. Risk factors include female gender, obesity, diabetes mellitus, and pregnancy. It would be unlikely to present with severe pain solely of the thumb associated with decreased muscle strength.

Cervical radiculopathy (Choice C) can cause numbness and paresthesia in any of the cervical spinal nerve distributions. Other symptoms include neck and shoulder pain, muscle weakness of the upper extremities, and decreased deep tendon reflexes. This patient has pain localized to the base of her thumb, which does not match a specific cervical spinal nerve distribution, making cervical radiculopathy less likely.

Diabetic neuropathy (Choice E) often presents with distal, progressive numbness and paresthesia of the extremities. Symptoms commonly begin in the toes and ascend in a stocking-glove pattern, eventually involving the upper extremities as well. Pain at the base of the thumb would be an uncommon presenting complaint for diabetic neuropathy.

Educational Objective: Degenerative joint disease, or osteoarthritis, is caused by repetitive wear-and-tear injury to a joint with subsequent cartilage degradation, bony sclerosis, and joint pain. Risk factors include age, obesity, and prior intra-articular injury. Treatment options include physical therapy, braces, weight loss, acetaminophen, intra-articular steroid injections, and if severe, joint replacement.

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23. A 42-year-old woman comes to the physician because of a 1-year history of increased drinking and difficulty swallowing because of a dry mouth. She also has noticed swelling of her cheeks and has had more dental cavities than usual during this period. She has no history of serious illness. She takes no medications. Vital signs are within normal limits. Examination shows enlarged parotid glands; slightly red eyes; and dry, cracked lips. Which of the following is the most appropriate next step in management?

A) Measurement of serum vitamin B_{12} (cobalamin) concentration
B) Serum antinuclear antibody assay
C) Oral amoxicillin therapy
D) Oral prednisone therapy
E) CT scan of the parotid glands

Correct Answer: B.

The most appropriate next step in the management of this patient with symptoms and signs suggestive of Sjogren syndrome is to perform a serum antinuclear antibody assay. Sjogren syndrome is a rheumatologic condition caused by autoantibodies to components of the lacrimal and salivary glands, leading to symptoms of dry eyes (xerophthalmia) and dry mouth (xerostomia). Parotid gland and lacrimal gland enlargement caused by chronic inflammation is seen. Cracked lips, foul breath, and increased dental caries occur secondary to xerostomia. It is often seen in association with rheumatoid arthritis and systemic lupus erythematosus. When Sjogren syndrome is suspected, specific serologic tests are useful in confirming the diagnosis. The most specific antibody serologies for Sjogren syndrome include the presence of anti-Ro/SSA with or without anti-La/SSB antibodies. The diagnosis can also be confirmed by salivary gland biopsy, those serologies should be performed first as this is a less invasive diagnostic test. Thus, in this case, a serum antinuclear antibody assay including anti-Ro and anti-La should be performed to confirm a clinical suspicion of Sjogren syndrome.

Incorrect Answers: A, C, D, and E.

Measurement of serum vitamin B_{12} (cobalamin) concentration (Choice A) is an appropriate next step in the evaluation of glossitis, which is characterized by pain, swelling, and tenderness of the tongue and can be caused by vitamin B_{12} deficiency. However, this patient's additional findings including increased dental cavities, enlarged parotid

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The most appropriate next step in the management of this patient with symptoms and signs suggestive of Sjogren syndrome is to perform a serum antinuclear antibody assay. Sjogren syndrome is a rheumatologic condition caused by autoantibodies to components of the lacrimal and salivary glands, leading to symptoms of dry eyes (xerophthalmia) and dry mouth (xerostomia). Parotid gland and lacrimal gland enlargement caused by chronic inflammation is seen. Cracked lips, foul breath, and increased dental caries occur secondary to xerostomia. It is often seen in association with rheumatoid arthritis and systemic lupus erythematosus. When Sjogren syndrome is suspected, specific serologic tests are useful in confirming the diagnosis. The most specific antibody serologies for Sjogren syndrome include the presence of anti-Ro/SSA with or without anti-La/SSB antibodies. The diagnosis can also be confirmed by salivary gland biopsy, those serologies should be performed first as this is a less invasive diagnostic test. Thus, in this case, a serum antinuclear antibody assay including anti-Ro and anti-La should be performed to confirm a clinical suspicion of Sjogren syndrome.

Incorrect Answers: A, C, D, and E.

Measurement of serum vitamin B_{12} (cobalamin) concentration (Choice A) is an appropriate next step in the evaluation of glossitis, which is characterized by pain, swelling, and tenderness of the tongue and can be caused by vitamin B_{12} deficiency. However, this patient's additional findings including increased dental cavities, enlarged parotid glands, red eyes, and dry lips are more suggestive of Sjogren syndrome.

Oral amoxicillin therapy (Choice C) is not indicated as the patient's symptoms are suggestive of Sjogren syndrome, not an infection. The diagnosis of Sjogren syndrome should be confirmed before treatment is initiated.

Oral prednisone therapy (Choice D) should not be prescribed empirically before a diagnosis is made. In this case, the most appropriate next step in management is to confirm a diagnosis of Sjogren syndrome before beginning treatment.

CT scan of the parotid glands (Choice E) is not necessary in this case. If she were to test negative for antinuclear antibodies or if her parotid enlargement were unilateral, then CT scan would be helpful to determine whether a structural defect or tumor were the cause of her symptoms. However, this patient's symptoms are well-aligned with Sjogren syndrome which does not require imaging for diagnosis.

Educational Objective: Sjogren syndrome is a rheumatologic condition caused by autoantibodies to components of the lacrimal and salivary glands, leading to symptoms of dry eyes (xerophthalmia) and dry mouth (xerostomia). The diagnosis is based on these findings and accompanying serologic or histologic evidence of autoimmunity.

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24. A randomized controlled trial shows that a new fecal occult blood test (FOBT) leads to an 80% decrease in the relative risk for death due to colorectal cancer. Which of the following additional information is most useful in understanding the impact of this test?

A) The nature of the chemical reaction by which FOBT detects cancer
B) The number of patients undergoing FOBT in this study
C) The relative risk of death among patients who undergo FOBT
D) The risk of death due to colorectal cancer among patients in the control group

Correct Answer: D.

In order to correctly interpret this decrease in relative risk (ie, relative risk reduction) of death caused by colorectal cancer attributable to the fecal occult blood test (FOBT), the risk of death caused by colorectal cancer among patients in the control group must be known. Relative risk reduction (RRR) is the proportion of risk reduction that can be attributed to the intervention compared to a control. The risk of death in the control group is important to know in order to understand the magnitude of the risk reduction. For example, if the risk of death in the control group is 1/1,000,000, a decrease by 80% will keep the risk of death nearly the same as it would decrease the number of deaths by less than one individual. However, if the risk of death in the control group is 100/1,000,000, then the intervention would decrease the number of deaths by 80 individuals. Thus, knowing the baseline risk of the control group is critical in interpreting the impact of the new test.

Incorrect Answers: A, B, and C.

The nature of the chemical reaction by which FOBT detects cancer (Choice A) does not change the impact of the test. While it could be useful to know this information in order to explain the test more thoroughly to patients, the impact of the test can be known without understanding the exact mechanism.

The number of patients undergoing FOBT in this study (Choice B) would also be useful information to determine whether the test had an adequate sample size but is less critical than knowing the baseline death rate in the control group. The risk reduction can be interpreted without knowing the sample size of the intervention group while it cannot be interpreted without knowing the baseline risk of death in the control group.

The relative risk of death among patients who undergo FOBT (Choice C) will describe the difference in likelihood of death from colon cancer between the FOBT and

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B) The number of patients undergoing FOBT in this study

C) The relative risk of death among patients who undergo FOBT

D) The risk of death due to colorectal cancer among patients in the control group

Correct Answer: D.

In order to correctly interpret this decrease in relative risk (ie, relative risk reduction) of death caused by colorectal cancer attributable to the fecal occult blood test (FOBT), the risk of death caused by colorectal cancer among patients in the control group must be known. Relative risk reduction (RRR) is the proportion of risk reduction that can be attributed to the intervention compared to a control. The risk of death in the control group is important to know in order to understand the magnitude of the risk reduction. For example, if the risk of death in the control group is 1/1,000,000, a decrease by 80% will keep the risk of death nearly the same as it would decrease the number of deaths by less than one individual. However, if the risk of death in the control group is 100/1,000,000, then the intervention would decrease the number of deaths by 80 individuals. Thus, knowing the baseline risk of the control group is critical in interpreting the impact of the new test.

Incorrect Answers: A, B, and C.

The nature of the chemical reaction by which FOBT detects cancer (Choice A) does not change the impact of the test. While it could be useful to know this information in order to explain the test more thoroughly to patients, the impact of the test can be known without understanding the exact mechanism.

The number of patients undergoing FOBT in this study (Choice B) would also be useful information to determine whether the test had an adequate sample size but is less critical than knowing the baseline death rate in the control group. The risk reduction can be interpreted without knowing the sample size of the intervention group while it cannot be interpreted without knowing the baseline risk of death in the control group.

The relative risk of death among patients who undergo FOBT (Choice C) will describe the difference in likelihood of death from colon cancer between the FOBT and control groups. This will not provide additional useful information beyond what is already known. To understand the impact of the test, it will be more useful to understand the baseline absolute risk in the control group.

Educational Objective: Relative risk reduction (RRR) is the proportion of risk reduction that can be attributed to the intervention compared to a control. When interpreting a reduction in risk that accompanies an intervention, it is important to understand the magnitude of the risk in the control group.

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25. A 4-month-old boy is brought to the office by his mother because of a 1-month history of feeding problems. The mother says her son often vomits after feeding and hiccups frequently. She also notes that he sometimes arches his back after feeding and appears to be in pain. The infant's diet consists primarily of cow milk-based formula, with occasional infant cereal and fruits. He is fed six times daily. Medical history is unremarkable and he takes no medications. Vaccinations are up-to-date. The patient is at the 10th percentile for length, weight, and head circumference. Vital signs are normal. Physical examination discloses no abnormalities. Which of the following is the most likely preliminary diagnosis?

A) Cow milk protein intolerance
B) Foreign body ingestion
C) Peptic ulcer disease
D) Pyloric stenosis
E) Reflux esophagitis

Correct Answer: E.

This infant's symptoms are most consistent with a preliminary diagnosis of reflux esophagitis. Gastroesophageal reflux of gastric contents into the lower esophagus is normal in many healthy infants and does not necessarily have pathologic consequences. It commonly occurs as a result of increased intra-abdominal pressure or diminished closing pressure of the lower esophageal sphincter permitting acidic contents of the stomach to reflux into the esophagus. However, when it causes changes to the esophageal mucosa (esophagitis), then it is referred to as gastroesophageal reflux disease (GERD) and is considered pathologic. Reflux esophagitis in infants is a pathologic consequence of GERD. In an infant, GERD presents with frequent regurgitation without excessive irritability. This patient additionally has back arching, apparent pain, and poor weight gain, suggesting that esophagitis is likely present. Treatment of GERD and reflux esophagitis in an infant includes lifestyle changes such as decreased feed volume while increasing frequency or keeping the infant upright for 20–30 minutes after a feed. A limited trial of pharmacotherapy such as a proton pump inhibitor may be tried in an infant with esophagitis but is generally not necessary in mild GERD.

Incorrect Answers: A, B, C, and D.

Cow milk protein intolerance (Choice A), or food protein intolerance, typically causes vomiting, diarrhea, dehydration, and failure to thrive. Bloody stool may be observed if

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This infant's symptoms are most consistent with a preliminary diagnosis of reflux esophagitis. Gastroesophageal reflux of gastric contents into the lower esophagus is normal in many healthy infants and does not necessarily have pathologic consequences. It commonly occurs as a result of increased intra-abdominal pressure or diminished closing pressure of the lower esophageal sphincter permitting acidic contents of the stomach to reflux into the esophagus. However, when it causes changes to the esophageal mucosa (esophagitis), then it is referred to as gastroesophageal reflux disease (GERD) and is considered pathologic. Reflux esophagitis in infants is a pathologic consequence of GERD. In an infant, GERD presents with frequent regurgitation without excessive irritability. This patient additionally has back arching, apparent pain, and poor weight gain, suggesting that esophagitis is likely present. Treatment of GERD and reflux esophagitis in an infant includes lifestyle changes such as decreased feed volume while increasing frequency or keeping the infant upright for 20–30 minutes after a feed. A limited trial of pharmacotherapy such as a proton pump inhibitor may be tried in an infant with esophagitis but is generally not necessary in mild GERD.

Incorrect Answers: A, B, C, and D.

Cow milk protein intolerance (Choice A), or food protein intolerance, typically causes vomiting, diarrhea, dehydration, and failure to thrive. Bloody stool may be observed if enterocolitis is present.

Foreign body ingestion (Choice B) would generally not cause chronic symptoms for over a month. This patient's symptoms are more consistent with gastroesophageal reflux leading to esophagitis.

Peptic ulcer disease (PUD) (Choice C) is uncommon in infants. When seen in children, it can be related to nonsteroidal anti-inflammatory medication use or *Helicobacter pylori* infection. It typically presents with epigastric discomfort, nausea, and vomiting, typically in temporal association with eating. PUD can be complicated by hemorrhage or perforation.

Pyloric stenosis (Choice D) is caused by hypertrophy of the pyloric sphincter, leading to gastric outlet obstruction and vomiting. It commonly presents with nonbloody, nonbilious emesis after feedings, and begins around 3 to 6 weeks of age. It is more common in male infants. Symptoms may begin with occasional vomiting, then progress to projectile emesis after every feed, dehydration, and malnutrition as the stenosis worsens.

Educational Objective: Reflux esophagitis refers to a pathologic change to the esophageal lining caused by chronic gastroesophageal reflux disease. In an infant, gastroesophageal reflux disease presents with frequent regurgitation without excessive irritability. Back arching, pain with regurgitation, and poor weight gain are additional findings that suggest esophagitis may be present.

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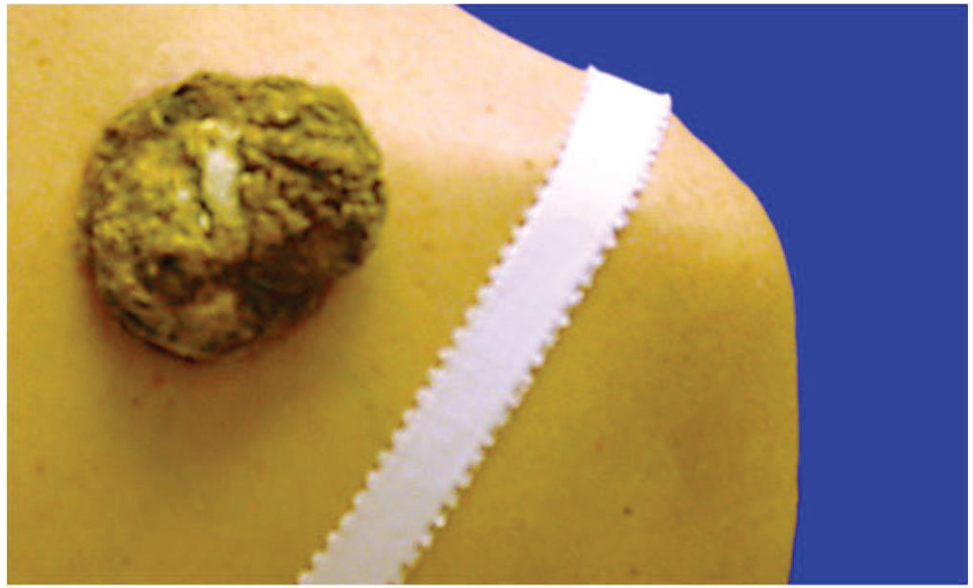

26. A 62-year-old woman is brought to the physician by her children 1 week after they noticed a large lesion on her right shoulder. She has lived alone since her husband died 6 months ago, and her family has recently become concerned that she is not caring for herself adequately. She says she thinks she has had the lesion for 1 year and that it has been increasing in size. She underwent renal transplantation 5 years ago and has taken prednisone and cyclosporine since then. She underwent radiation therapy on her face for treatment of acne as a teenager. Her sister died of skin cancer 3 years ago at the age of 65 years. The patient has smoked one pack of cigarettes daily for 45 years. She was employed as a landscaper for 25 years. She appears disheveled and is poorly groomed. Examination shows a 5-cm lesion on the posterior right shoulder. A photograph of the patient's back is shown. Which of the following is the most likely cause of the lesion?

A) Cigarette smoking
B) Congenital predisposition
C) History of radiation therapy

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A) Cigarette smoking
B) Congenital predisposition
C) History of radiation therapy
D) Inadequate personal hygiene
E) Long-term immunosuppression therapy

Correct Answer: E.

Long-term immunosuppression therapy is the primary factor driving the development of this large squamous cell carcinoma. Squamous cell carcinoma is a common form of skin cancer and is derived from the epithelial cells of the epidermis. In most cases, the primary risk factor for developing squamous cell carcinoma is ultraviolet light exposure with age and family history contributing. However, chronic immunosuppression in solid organ transplant recipients increases the risk for developing squamous cell carcinoma by 65 times greater than that of the non-transplant patient. In this patient population, the risk for squamous cell carcinoma increases with the degree of immunosuppression required. The risk for melanoma and basal cell carcinoma is relatively unaffected by chronic immunosuppression. Squamous cell carcinomas typically present as hyperkeratotic, crusted papules, plaques, or nodules, which may be ulcerated. The risk for metastasis increases with increasing size of the tumor and a location on the head and neck. Diagnosis is with skin biopsy, which should be incisional in this case. Treatment of squamous cell carcinoma requires surgical removal, either through excision or Mohs micrographic surgery.

Incorrect Answers: A, B, C, and D.

Cigarette smoking (Choice A) is associated with increased risk for squamous cell carcinoma on parts of the body such as the oral mucosa, throat, and esophagus, but it is

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Correct Answer: E.

Long-term immunosuppression therapy is the primary factor driving the development of this large squamous cell carcinoma. Squamous cell carcinoma is a common form of skin cancer and is derived from the epithelial cells of the epidermis. In most cases, the primary risk factor for developing squamous cell carcinoma is ultraviolet light exposure with age and family history contributing. However, chronic immunosuppression in solid organ transplant recipients increases the risk for developing squamous cell carcinoma by 65 times greater than that of the non-transplant patient. In this patient population, the risk for squamous cell carcinoma increases with the degree of immunosuppression required. The risk for melanoma and basal cell carcinoma is relatively unaffected by chronic immunosuppression. Squamous cell carcinomas typically present as hyperkeratotic, crusted papules, plaques, or nodules, which may be ulcerated. The risk for metastasis increases with increasing size of the tumor and a location on the head and neck. Diagnosis is with skin biopsy, which should be incisional in this case. Treatment of squamous cell carcinoma requires surgical removal, either through excision or Mohs micrographic surgery.

Incorrect Answers: A, B, C, and D.

Cigarette smoking (Choice A) is associated with increased risk for squamous cell carcinoma on parts of the body such as the oral mucosa, throat, and esophagus, but it is not a significant risk factor for cutaneous squamous cell carcinoma.

Congenital predisposition (Choice B) can be a factor in squamous cell carcinoma development but would be less of a contributor in this case than her chronic immunosuppression.

History of radiation therapy (Choice C) to the face for acne is a risk factor for basal cell carcinoma. However, this tumor on the back is most consistent in appearance with a squamous cell carcinoma and this area of her body was not treated with radiation.

Inadequate personal hygiene (Choice D) does not cause squamous cell carcinoma to develop but may have contributed to the size of the lesion and its going undetected until it was several centimeters in diameter.

Educational Objective: Squamous cell carcinomas of the skin typically present as hyperkeratotic, crusted papules, plaques, or nodules, which may be ulcerated. Solid organ transplant recipients are at greatly increased risk for developing squamous cell carcinomas secondary to chronic immunosuppression. The risk increases in a dose-dependent fashion with increasing immunosuppression.

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27. A 27-year-old primigravid woman at 10 weeks' gestation comes to the physician for her first prenatal visit. Examination shows a uterus consistent in size with a 10-week gestation. Laboratory studies show:

Hemoglobin	10.5 g/dL
Mean corpuscular hemoglobin	27.8 pg/cell
Mean corpuscular hemoglobin concentration	29% Hb/cell
Mean corpuscular volume	75 μm^3
Leukocyte count	10,000/mm^3
Platelet count	174,000/mm^3

Which of the following is the most likely diagnosis?

A) Folic acid deficiency
B) Hereditary spherocytosis
C) Iron deficiency anemia
D) Physiologic anemia of pregnancy
E) Sickle cell disease

Correct Answer: C.

The most likely diagnosis to explain the presence of microcytic anemia in this patient is iron deficiency anemia (IDA). Iron is required for the synthesis of heme, which is a necessary component of the hemoglobin molecule to transport oxygen to peripheral tissues. In pregnant patients, IDA is typically caused by increased metabolic demand for iron (up to two to three times the daily requirement compared to nonpregnant adults). Other common causes of IDA include occult gastrointestinal bleeding, heavy menstruation, limited dietary intake, malabsorption, and malnutrition. Additional iron studies, including serum iron and ferritin concentrations, total iron-binding capacity, and transferrin saturation, can confirm the diagnosis. Peripheral blood smear typically shows erythrocytes that are pale (hypochromic), small in size (microcytic), and normal in shape.

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E) Sickle cell disease

Correct Answer: C.

The most likely diagnosis to explain the presence of microcytic anemia in this patient is iron deficiency anemia (IDA). Iron is required for the synthesis of heme, which is a necessary component of the hemoglobin molecule to transport oxygen to peripheral tissues. In pregnant patients, IDA is typically caused by increased metabolic demand for iron (up to two to three times the daily requirement compared to nonpregnant adults). Other common causes of IDA include occult gastrointestinal bleeding, heavy menstruation, limited dietary intake, malabsorption, and malnutrition. Additional iron studies, including serum iron and ferritin concentrations, total iron-binding capacity, and transferrin saturation, can confirm the diagnosis. Peripheral blood smear typically shows erythrocytes that are pale (hypochromic), small in size (microcytic), and normal in shape.

Incorrect Answers: A, B, D, and E.

Folic acid deficiency (Choice A) is a cause of megaloblastic macrocytic anemia that is common in pregnancy because of increased folic acid requirements, especially when accompanied by malnutrition. Folate supplements are recommended as part of routine prenatal care.

Hereditary spherocytosis (Choice B) is caused by autosomal dominant mutations in ankyrin, spectrin, and band erythrocyte membrane proteins that lead to a loss of the normal connection between the inner membrane skeleton and the outer lipid bilayer. Symptomatic patients typically present with hemolytic anemia. Peripheral blood smear will show spherocytes, and laboratory studies will exhibit a normocytic anemia with increased mean corpuscular hemoglobin concentration.

Physiologic anemia of pregnancy (Choice D) is caused by the normal expansion in blood plasma volume that occurs during pregnancy. Total erythrocyte mass increases as well during pregnancy, but there is a greater relative increase in the blood plasma volume, which results in a relative anemia on laboratory analysis without a reduction in total oxygen-carrying capacity. A normal mean corpuscular volume would be expected.

Sickle cell disease (Choice E) can present with several different types of anemia, including chronic compensated hemolytic anemia, acute decompensated hemolytic anemia, aplastic crisis, and splenic sequestration, although these would demonstrate a normal mean corpuscular volume.

Educational Objective: Iron deficiency is the most common cause of microcytic anemia. Pregnant patients are at risk for developing iron deficiency anemia caused by the physiologic increase in erythrocyte count and increased metabolic demand for iron during pregnancy.

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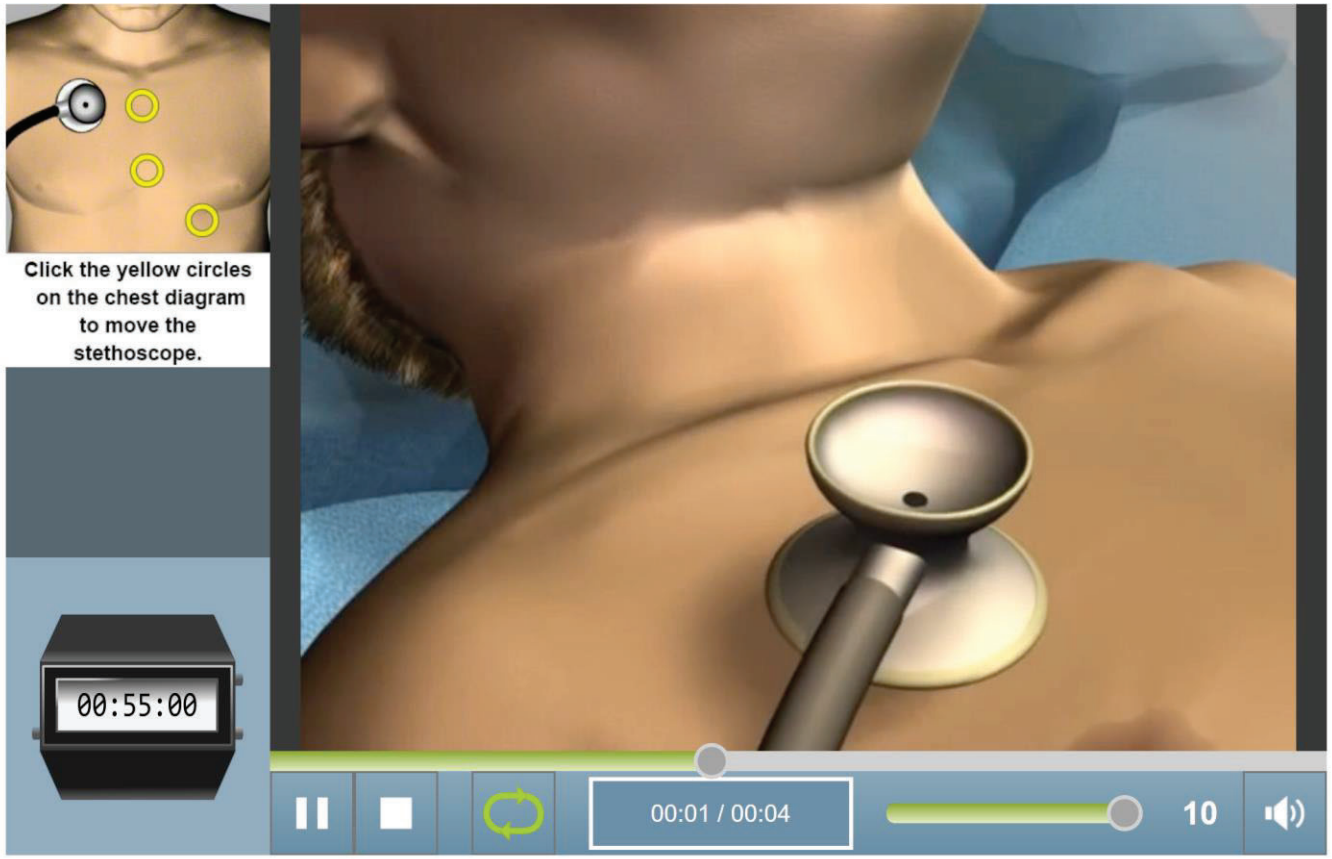

28. A previously healthy 4-year-old boy is brought to the physician because of a 3-day history of fever, cough, and runny nose. He has not had wheezing, vomiting, or diarrhea. He is at the 75th percentile for height and 10th percentile for weight. His temperature is 37.5°C (99.5°F). The skin is warm and pink. Capillary refill time is 2 seconds. Examination shows clear rhinorrhea. Breath sounds are normal. Cardiac examination is shown. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

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A) Congestive heart failure
B) Idiopathic pulmonary hypertension
C) Pericarditis
D) Upper respiratory tract infection
E) Ventricular septal defect

Correct Answer: D.

Many children will experience multiple benign, viral upper respiratory tract infections each year in infancy and childhood. Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Systemic symptoms such as chills, myalgias, arthralgias, and fatigue may occur as with any viral syndrome. The patient in this example presents with signs of a viral upper respiratory tract infection without any evidence of significant or serious bacterial infection (eg, pneumonia). Treatment includes supportive care, as most cases are self-limited and without complication, though parents should observe for persistent fevers, productive cough, or ear pain or discharge, as these may be signs of progression to pneumonia or acute otitis media. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation; these can be distinguished from pulmonary or cardiac sounds by listening with one earpiece of the stethoscope, permitting one-sided chest auscultation and correlation with external, ambient breath sounds from the patient in the non-auscultating ear.

Incorrect Answers: A, B, C, and E.

Congestive heart failure (Choice A) is uncommon in children apart from in cases of congenital heart disease. It generally presents with cough and shortness of breath (when left-sided) and with edema, hepatomegaly, or jugular venous distention (JVD) (when right-sided). Murmurs may be present on auscultation

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Idiopathic pulmonary hypertension (Choice B) generally presents with shortness of breath, chest discomfort on exertion, and signs of right-sided heart failure (eg, edema, hepatomegaly, JVD). Pulmonic or tricuspid murmurs may be heard, especially a loud P_2, and tricuspid regurgitation.

Pericarditis (Choice C) presents with central chest discomfort that often follows a viral infection. Pain is generally worse when supine and improved when upright; a friction rub is classically heard on auscultation.

Ventricular septal defect (Choice E) presents with a holosystolic murmur located at the midsternal area on the left. They are often asymptomatic and incidentally present in an estimated 1 to 2% of newborns, often spontaneously closing over the first years of life.

Educational Objective: Upper respiratory tract infections are characterized by rhinorrhea, congestion, post-nasal drainage, sore throat, cough, fever, or chills. They are generally not accompanied by chest congestion, sputum production, chest discomfort, or shortness of breath. Notably, accessory sounds from the upper airway (eg, congestion) may be transmitted through the respiratory tract and heard on chest auscultation. These should be distinguished from rhonchi, rales, wheezes, and murmurs, friction rubs or gallops.

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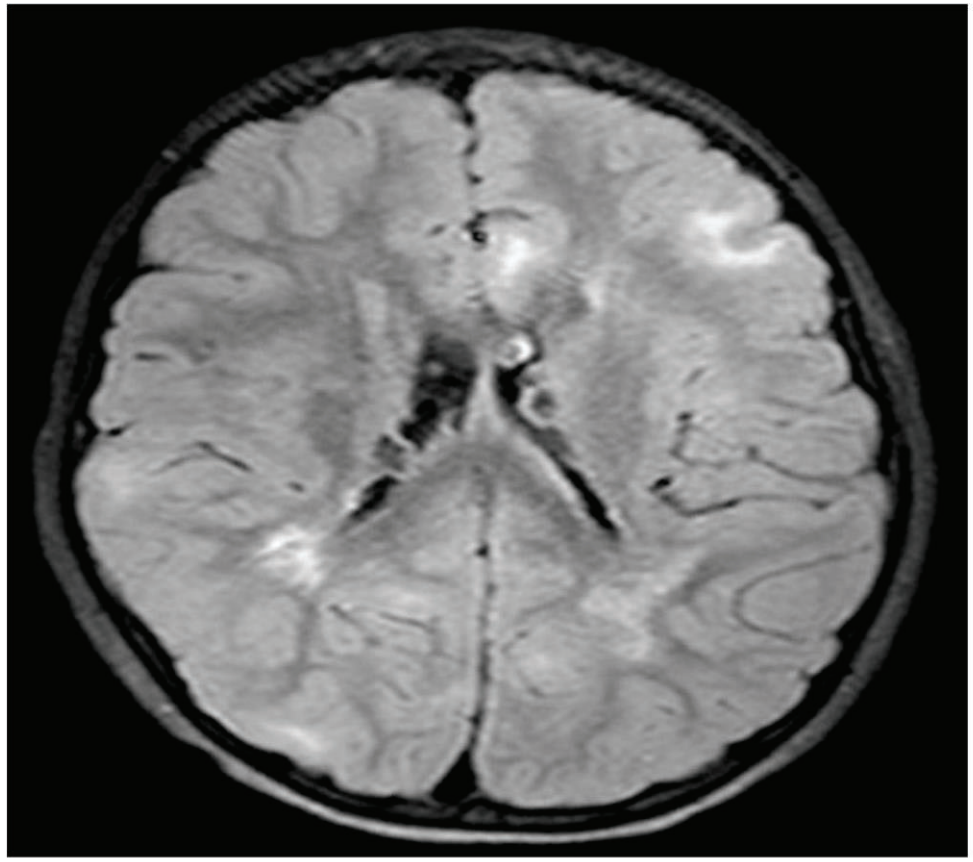

29. A 6-year-old girl with a history of delayed motor and language development is brought to the physician by her parents because of three episodes of "staring off" during the past 5 weeks. During the episodes, she turns her head to the left, extends her left arm, and does not respond to questions; each episode lasts 2 minutes. After the episode, she is confused and wants to sleep. She was born at term following an uncomplicated pregnancy and spontaneous vaginal delivery. Examination shows no dysmorphic features. There are a few hypopigmented macules over the abdomen and lower extremities. Language development is at the level of a

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A) Linear sebaceous nevus
B) Neurofibromatosis
C) Sturge-Weber syndrome
D) Tuberous sclerosis
E) von Hippel-Lindau syndrome

Correct Answer: D.

Tuberous sclerosis complex (TSC) is an autosomal dominant neurocutaneous disorder characterized by benign tumors called hamartomas in several organ systems, particularly the skin and central nervous system (CNS). TSC is caused by a genetic mutation in either the TSC1 or TSC2 genes. Cutaneous findings include hypopigmented macules or “confetti” macules on the trunk, ash leaf spots (hypopigmented oval macules or patches), angiofibromas on the face and around the nails, shagreen patch (typically on the lower back), and fibrous plaques on the forehead. The hypomelanotic macules and fibrous forehead plaque are often the first cutaneous manifestations to occur in childhood. Characteristic CNS lesions include glioneuronal hamartomas (also called cortical tubers), subependymal nodules, and subependymal giant cell tumors. Seizure is the most common initial presentation of TSC. Cognitive dysfunction is common, occurring in nearly two thirds of patients with TSC. Tumors in other organ systems, like cardiac rhabdomyomas (leading to mitral regurgitation) and renal angiomyolipomas, may be present. Though these tumors are benign, patients are at risk for developing malignancies in the soft tissues, brain, or kidney.

Incorrect Answers: A, B, C, and E.

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Incorrect Answers: A, B, C, and E.

Linear sebaceous nevus (Choice A) is a localized overgrowth of sebaceous glands causing a yellow-orange, bald, smooth plaque usually on the scalp or neck of a child where sebaceous gland density is highest. It is usually an isolated finding without associated seizures or development delay. However, when several sebaceous nevi are present, linear nevus sebaceous syndrome (Schimmelpenning syndrome) may be present. Linear sebaceous nevus syndrome is associated with seizures and intellectual disability. However, it is not the diagnosis in this case as the child's examination does not show any sebaceous nevi.

Neurofibromatosis (Choice B) is a heritable neurocutaneous disorder that presents with cutaneous neurofibromas (benign neoplasms derived from neural crest cells), café au lait spots, pigmented iris hamartomas (Lisch nodules), optic gliomas, and pheochromocytomas. This autosomal dominant disorder results from a de novo or inherited mutated *NF1* tumor suppressor gene. This child demonstrates ash leaf macules (which are hypopigmented) rather than café au lait spots (which are hyperpigmented).

Sturge-Weber syndrome (Choice C) is a neurocutaneous disorder that presents with proliferation of capillary-size blood vessels, seen on examination as nevus flammeus (a benign birthmark also known as a port-wine stain), angiomatosis of the leptomeninges (leading to seizures, intellectual disability, focal neurologic deficits), and episcleral hemangioma (leading to early-onset glaucoma). This child does not have a port-wine stain.

Von Hippel-Lindau syndrome (Choice E) is an autosomal dominant neurocutaneous disorder that presents with multiple benign and malignant tumors. Many tumors originate from the vasculature, including hemangioblastomas of the retina and CNS and angiomatosis of the skin and mucosa, which this patient does not demonstrate. Pheochromocytomas and bilateral renal cell carcinomas are frequently seen.

Educational Objective: Tuberous sclerosis complex (TSC) is an autosomal dominant neurocutaneous disorder characterized by benign tumors called hamartomas. A constellation of seizures, cognitive delay, and distinctive cutaneous findings (hypopigmented macules on the trunk, ash leaf spots, angiofibromas, shagreen patch, and fibrous forehead plaque) is a common presentation of the syndrome.

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30. A study is conducted to determine the efficacy of cervical cerclage to prevent preterm birth. Pregnant patients at 16 weeks' gestation are enrolled, and their cervical length is measured transvaginally by ultrasonography. If cervical length is found to be less than 25 mm, the patient is offered cerclage or bed rest. Patients are observed until delivery, and outcome data are collected. Which of the following is the best description of this type of study?

A) Case-control
B) Case-matched
C) Cohort
D) Descriptive
E) Randomized

Correct Answer: C.

The study design is best characterized as a prospective cohort study. Cohort studies in general identify a group of patients with or without an exposure and assess whether the exposure is associated with an outcome of interest. In a prospective design, the hypothesis and analysis protocols are established prior to the start of the study period. In a retrospective design the hypothesis or question is designed after the study time period has passed. Cohort studies calculate relative risk (RR) by comparing the frequency with which the outcome occurs in the exposed group to the non-exposed group.

Incorrect Answers: A, B, D, and E.

Case-control (Choice A) studies group patients according to disease outcome status and analyze the odds of exposure to a particular hazard. In this study design, a group of patients with the disease (cases) are identified. Case-matched (Choice B) controls without the disease are selected using baseline characteristics. The two groups are then compared with regard to the exposure of interest. The appropriate statistical measure of case-control studies is the odds ratio (OR).

Descriptive (Choice D) studies include case reports, case series, cross-sectional studies, and individual or population surveillance studies. Descriptive studies are used to describe new or unusual diseases, analyze trends, and identify areas for more rigorous research.

Randomized (Choice E) is a stringent type of prospective study wherein patients are randomly assigned to receive a particular intervention. The intervention may be

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Descriptive (Choice D) studies include case reports, case series, cross-sectional studies, and individual or population surveillance studies. Descriptive studies are used to describe new or unusual diseases, analyze trends, and identify areas for more rigorous research.

Randomized (Choice E) is a stringent type of prospective study wherein patients are randomly assigned to receive a particular intervention. The intervention may be compared against placebo therapy or against standard therapy, depending on the study design. When combined with blinding procedures, prospective, randomized control studies form the gold standard of medical research and generate strong evidence as compared to observational or descriptive studies.

Educational Objective: A cohort study follows patients over a period of time, either retrospectively or prospectively, and seeks to investigate the impact of exposures or risk factors on an outcome of interest.

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31. A 67-year-old woman, gravida 5, para 5, is admitted to the hospital because of a 6-month history of increasingly severe abdominal pain and distention and difficulty eating. During the past 2 weeks, she has had increased abdominal girth. She also has had a 4-day history of nausea and vomiting. Ten years ago, she had breast cancer treated with bilateral mastectomy; she took tamoxifen therapy for 6 years. Her pulse is 68/min, respirations are 20/min, and blood pressure is 124/72 mm Hg. Breath sounds are decreased at the lung bases. The abdomen is distended, tense, and tender; there is a fluid shift. The genitalia are normal. On bimanual examination, a midline pelvic mass is palpated and several 1-cm nodules are palpated along the rectovaginal septum. Laboratory studies show:

Hemoglobin	10.2 g/dL
Serum	
Urea nitrogen	10 mg/dL
Creatinine	1 mg/dL
CA 125	2270 U/mL (N<35)

Following surgical removal of the masses, which of the following is the most appropriate next step in management?

A) Observation only
B) Hormone therapy
C) Immunotherapy
D) Chemotherapy
E) Radiation therapy

Correct Answer: D.

In postmenopausal women, a palpable ovary or pelvic mass raises concern for ovarian cancer, and the finding of an increased CA-125 concentration is consistent with this diagnosis. If discovered early, an ovarian malignancy can present as a mass on pelvic examination or imaging, though ovarian cancer classically presents late in the course and is often metastatic and invasive at the time of discovery. Presenting features are often nonspecific, and may include weight loss, abdominal discomfort or distention, ascites, and gastrointestinal symptoms including early satiety, bloating, nausea, cramping, and bowel obstruction. Bowel obstruction can be caused by locally invasive disease or peritoneal carcinomatosis, which is a common presenting diagnosis. Ovarian cancer is potentially hereditary, with an increased frequency of cases

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Incorrect Answers: A, B, C, and E.

Observation only (Choice A) is not appropriate management at this time. Treatment of epithelial cancers of ovarian, fallopian tube, and peritoneal origin with primary surgical resection followed by systemic chemotherapy confers the best survival outcomes.

Hormone therapy (Choice B) is occasionally utilized in the treatment of recurrent ovarian cancer. First-line treatment for initial disease consists of platinum-based chemotherapy.

Immunotherapy (Choice C), specifically with the vascular endothelial growth factor monoclonal antibody bevacizumab, can be considered as a second-line option for platinum-resistant ovarian cancer or as an adjunct to single-agent chemotherapy options.

Radiation therapy (Choice E) is less effective than surgical resection plus systemic chemotherapy and is rarely utilized as a treatment for ovarian cancer.

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D) Chemotherapy

E) Radiation therapy

Correct Answer: D.

In postmenopausal women, a palpable ovary or pelvic mass raises concern for ovarian cancer, and the finding of an increased CA-125 concentration is consistent with this diagnosis. If discovered early, an ovarian malignancy can present as a mass on pelvic examination or imaging, though ovarian cancer classically presents late in the course and is often metastatic and invasive at the time of discovery. Presenting features are often nonspecific, and may include weight loss, abdominal discomfort or distention, ascites, and gastrointestinal symptoms including early satiety, bloating, nausea, cramping, and bowel obstruction. Bowel obstruction can be caused by locally invasive disease or peritoneal carcinomatosis, which is a common presenting diagnosis. Ovarian cancer is potentially hereditary, with an increased frequency of cases seen in women with mutations in *BRCA1/2* and Lynch syndrome. Additional major risk factors include an increased age, smoking, nulliparity, and polycystic ovarian syndrome. Treatment includes surgical resection and debulking plus chemotherapy. Early diagnosis and treatment are key to maximize survival.

Incorrect Answers: A, B, C, and E.

Observation only (Choice A) is not appropriate management at this time. Treatment of epithelial cancers of ovarian, fallopian tube, and peritoneal origin with primary surgical resection followed by systemic chemotherapy confers the best survival outcomes.

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Radiation therapy (Choice E) is less effective than surgical resection plus systemic chemotherapy and is rarely utilized as a treatment for ovarian cancer.

Educational Objective: In postmenopausal women, a palpable ovary raises concern for an ovarian malignancy. Ovarian cancer typically presents with vague symptoms and is usually discovered at an advanced stage. The first-line therapy recommendation is surgical resection followed by systemic chemotherapy, preferably with a platinum-based agent.

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32. A previously healthy 32-year-old woman comes to the physician because of a 3-month history of intermittent milky discharge from her breasts. During the past year, menses have occurred at irregular 15- to 32-day intervals. She takes no medications. Her mother and sister were diagnosed with pituitary tumors at the ages of 50 and 44 years, respectively; they also have increased serum calcium concentrations. The patient's temperature is 36.9°C (98.4°F), pulse is 90/min and regular, respirations are 14/min, and blood pressure is 156/70 mm Hg. On examination, milky discharge is expressed from both breasts. The remainder of the examination, including funduscopic examination and visual field testing, shows no abnormalities. Serum studies show:

Na^+	140 mEq/L
K^+	3.9 mEq/L
Cl^-	109 mEq/L
Ca^{2+}	12.4 mg/dL
Urea nitrogen	30 mg/dL
Glucose	90 mg/dL
Creatinine	1.2 mg/dL
Protein, total	9 g/dL
Albumin	4.8 g/dL
Phosphorus	2 mg/dL
Intact parathyroid hormone	90 pg/mL (N=10–65)
Prolactin	140 ng/mL
β-hCG	<5 mIU/mL

In addition to bromocriptine therapy, which of the following is the most appropriate next step in management?

A) Adrenal tumor resection
B) Bisphosphonate therapy
C) Estrogen therapy
D) Pituitary adenoma resection

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Intact parathyroid hormone	90 pg/mL (N=10–65)
Prolactin	140 ng/mL
β-hCG	<5 mIU/mL

In addition to bromocriptine therapy, which of the following is the most appropriate next step in management?

A) Adrenal tumor resection
B) Bisphosphonate therapy
C) Estrogen therapy
D) Pituitary adenoma resection
E) Prednisone therapy
F) Subtotal parathyroid resection

Correct Answer: F.

The patient's presentation is concerning for an underlying multiple endocrine neoplasia (MEN) syndrome, which are autosomal dominant hereditary disorders that are associated with a predisposition to tumors of the endocrine system. The MEN syndromes are classified into several subtypes. MEN1 is characterized by often functional pituitary, pancreatic, and parathyroid tumors. Pituitary tumors may secrete prolactin (as in this patient, resulting in galactorrhea) or growth hormone, pancreatic tumors may secrete insulin, glucagon, or vasoactive intestinal peptide, and parathyroid adenomas may secrete parathyroid hormone (PTH). Multiple functional parathyroid tumors are the most common manifestation of MEN1, and patients typically develop primary hyperparathyroidism. Surgical resection is recommended for patients with symptomatic or marked hypercalcemia, nephrolithiasis, or evidence of mineral bone disorder (decreased bone density on imaging or pathologic fracture). Given the presence of significant hypercalcemia and an increased intact PTH concentration, the most appropriate next step in management for this patient is counseling the patient on a subtotal parathyroid resection to reduce PTH secretion.

Incorrect Answers: A, B, C, D, and E.

Adrenal tumor resection (Choice A) is not indicated at this time. MEN1 is associated with adrenal tumors late in the course of the disease, although they are typically small,

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pituitary, pancreatic, and parathyroid tumors. Pituitary tumors may secrete prolactin (as in this patient, resulting in galactorrhea) or growth hormone, pancreatic tumors may secrete insulin, glucagon, or vasoactive intestinal peptide, and parathyroid adenomas may secrete parathyroid hormone (PTH). Multiple functional parathyroid tumors are the most common manifestation of MEN1, and patients typically develop primary hyperparathyroidism. Surgical resection is recommended for patients with symptomatic or marked hypercalcemia, nephrolithiasis, or evidence of mineral bone disorder (decreased bone density on imaging or pathologic fracture). Given the presence of significant hypercalcemia and an increased intact PTH concentration, the most appropriate next step in management for this patient is counseling the patient on a subtotal parathyroid resection to reduce PTH secretion.

Incorrect Answers: A, B, C, D, and E.

Adrenal tumor resection (Choice A) is not indicated at this time. MEN1 is associated with adrenal tumors late in the course of the disease, although they are typically small, benign, and nonfunctional. Surgical resection may be indicated for functional, symptomatic adrenal tumors.

Bisphosphonate therapy (Choice B) can be initiated in patients with hyperparathyroidism who have evidence of decreased bone mineral density, especially if subtotal parathyroid resection fails to reduce PTH concentrations. Cinacalcet, a calcimimetic agent that inhibits PTH secretion, is also used in the medical management of hyperparathyroidism to lower serum calcium concentrations.

Estrogen therapy (Choice C) is not routinely used in the management of MEN1 symptoms attributable to functional endocrine tumors. The patient will benefit most from bromocriptine to suppress pituitary secretion of prolactin and subtotal parathyroid resection to reduce PTH secretion.

Pituitary adenoma resection (Choice D) through transsphenoidal surgery is considered for patients with pituitary macroadenomas or symptomatic pituitary microadenomas that fail treatment with a dopamine agonist. The patient should be started on bromocriptine and monitored before considering surgery.

Prednisone therapy (Choice E) is not currently indicated. Adrenal tumors are associated with MEN1, with the potential risk for adrenal insufficiency. Exogenous corticosteroids may be required if adrenal insufficiency develops.

Educational Objective: Multiple endocrine neoplasia syndrome type 1 is characterized by pituitary, pancreatic, and parathyroid tumors that may increase serum concentrations of active hormones. Hyperparathyroidism and hypercalcemia are common complications of parathyroid tumors in the setting of MEN1. Subtotal parathyroid resection is recommended for treatment to reduce PTH secretion.

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33. A 67-year-old man is brought to the emergency department because of a 20-minute history of palpitations, dizziness, and fatigue. He has hypertension controlled with hydrochlorothiazide and lisinopril. His pulse is 110/min and irregular, respirations are 18/min, and blood pressure is 126/70 mm Hg. Examination shows no other abnormalities. An ECG shows atrial fibrillation. Which of the following is the most appropriate next step in management?

A) Cardiac catheterization
B) Chemical cardioversion
C) Clopidogrel therapy
D) Low-molecular-weight heparin therapy
E) Metoprolol therapy

Correct Answer: E.

Atrial fibrillation typically presents with palpitations, fatigue, lightheadedness, and mild dyspnea if symptomatic. On ECG, atrial fibrillation discloses irregularly irregular RR intervals without discernible P waves. Atrial fibrillation with rapid ventricular response (pulse >100 beats/minute) can cause lightheadedness and dizziness because of decreased left ventricular filling and decreased cardiac output. In normal sinus rhythm, an ideal stroke volume is achieved as the diastolic filling time is sufficiently long to allow the ventricles to fill completely before contraction occurs. In atrial fibrillation with rapid ventricular response (and in other tachyarrhythmias), diastolic filling time is reduced, so the amount of blood in the ventricles prior to ventricular systole is less than would exist had filling time been sufficient. This results in a reduced stroke volume, decreased cardiac output, symptomatic heart failure, and potentially hypotension and hemodynamic instability in severe cases. Rate control with metoprolol can help decrease pulse, increase left ventricular filling, increase cardiac output, and has been shown to decrease mortality in patients with atrial fibrillation.

Incorrect Answers: A, B, C, and D.

Cardiac catheterization (Choice A) would be appropriate in a patient with myocardial infarction or acute coronary syndrome (ACS). This patient does not have any signs or symptoms of ACS such as chest pain, shortness of breath, diaphoresis, or nausea, and ECG does not show ST segment elevation or depression.

Chemical cardioversion (Choice B) would not be a likely next step because it is unknown when the atrial fibrillation started and there is a risk for embolization from atrial

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D) Low-molecular-weight heparin therapy

E) Metoprolol therapy

Correct Answer: E.

Atrial fibrillation typically presents with palpitations, fatigue, lightheadedness, and mild dyspnea if symptomatic. On ECG, atrial fibrillation discloses irregularly irregular RR intervals without discernible P waves. Atrial fibrillation with rapid ventricular response (pulse >100 beats/minute) can cause lightheadedness and dizziness because of decreased left ventricular filling and decreased cardiac output. In normal sinus rhythm, an ideal stroke volume is achieved as the diastolic filling time is sufficiently long to allow the ventricles to fill completely before contraction occurs. In atrial fibrillation with rapid ventricular response (and in other tachyarrhythmias), diastolic filling time is reduced, so the amount of blood in the ventricles prior to ventricular systole is less than would exist had filling time been sufficient. This results in a reduced stroke volume, decreased cardiac output, symptomatic heart failure, and potentially hypotension and hemodynamic instability in severe cases. Rate control with metoprolol can help decrease pulse, increase left ventricular filling, increase cardiac output, and has been shown to decrease mortality in patients with atrial fibrillation.

Incorrect Answers: A, B, C, and D.

Cardiac catheterization (Choice A) would be appropriate in a patient with myocardial infarction or acute coronary syndrome (ACS). This patient does not have any signs or symptoms of ACS such as chest pain, shortness of breath, diaphoresis, or nausea, and ECG does not show ST segment elevation or depression.

Chemical cardioversion (Choice B) would not be a likely next step because it is unknown when the atrial fibrillation started and there is a risk for embolization from atrial thrombi and ischemic stroke. Typically, cardioversion is done after several weeks of anticoagulation or after an echocardiography shows an absence of intracardiac thrombosis. Emergent electrical cardioversion would only be indicated in a hemodynamically unstable patient.

While the patient may require clopidogrel (anti-platelet) (Choice C) or low molecular-weight heparin (anticoagulation) (Choice D) therapy to decrease the risk for stroke. The risks and benefits of each versus no therapy must be discussed with the patient. A rate-controlling agent such as metoprolol is appropriate to start now to decrease pulse and manage rapid ventricular response.

Educational Objective: Metoprolol is one of the first-line agents that can be used in the treatment of atrial fibrillation with rapid ventricular response. Generally, rate control is preferable to rhythm control in atrial fibrillation as the risk for adverse outcomes has been shown to be lower.

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34. An 82-year-old woman is brought to the emergency department 30 minutes after collapsing at a shopping center. She was intubated at the scene. On admission, she is comatose and requires mechanical ventilation. Her pulse is 120/min, respirations are 12/min, and blood pressure is 90/60 mm Hg. She does not respond to painful stimuli. Thirty minutes later, her granddaughter comes to the hospital and shows the physician an advance directive signed by the patient requesting no intubation or "artificial means to prolong life." Which of the following is the most appropriate next step in management?

A) Contact the hospital ethics committee
B) Contact the patient's attorney regarding plans for extubation
C) Continue mechanical ventilation and monitor closely in the coronary care unit
D) Obtain nuclear brain blood flow scan to determine brain death
E) Extubate the patient and provide supportive care only

Correct Answer: E.

Advance directives are legal documents that enable patients to dictate their preferences for end-of-life care ahead of time. Capacitated patients can express wishes that supersede the preferences outlined in the advance directive. However, advance directives are especially important when patients become incapacitated and are no longer able to verbalize their wishes for care. Since this patient is no longer able to express her preferences, the medical team should act in accordance with her advance directive and extubate her.

Incorrect Answers: A, B, C, and D.

Contacting the hospital ethics committee (Choice A) may be indicated if a patient expresses wishes that conflict with their previously stated wishes and their decisional capacity is impaired. However, in this case, there are no conflicting preferences.

Contacting the patient's attorney regarding plans for extubation (Choice B) would be unnecessary. Durable powers of attorney act as patients' health care proxies if patients become incapacitated. However, advance directives serve the same purpose, and this patient's advance directive clearly states her preferences regarding intubation.

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D) Obtain nuclear brain blood flow scan to determine brain death

E) Extubate the patient and provide supportive care only

Correct Answer: E.

Advance directives are legal documents that enable patients to dictate their preferences for end-of-life care ahead of time. Capacitated patients can express wishes that supersede the preferences outlined in the advance directive. However, advance directives are especially important when patients become incapacitated and are no longer able to verbalize their wishes for care. Since this patient is no longer able to express her preferences, the medical team should act in accordance with her advance directive and extubate her.

Incorrect Answers: A, B, C, and D.

Contacting the hospital ethics committee (Choice A) may be indicated if a patient expresses wishes that conflict with their previously stated wishes and their decisional capacity is impaired. However, in this case, there are no conflicting preferences.

Contacting the patient's attorney regarding plans for extubation (Choice B) would be unnecessary. Durable powers of attorney act as patients' health care proxies if patients become incapacitated. However, advance directives serve the same purpose, and this patient's advance directive clearly states her preferences regarding intubation.

Continuing mechanical ventilation and monitoring closely in the coronary care unit (Choice C) would violate the wishes stated in the patient's advance directive. According to the ethical principle of autonomy, patient's expressed wishes about care should be respected.

Obtaining a nuclear brain blood flow scan to determine brain death (Choice D) would be unnecessary given that the patient's advance directive instructs against using intubation or other life prolonging measures. A patient's preferences for life prolonging measures would not apply in cases of brain death because brain death constitutes legal death and medical teams can legally withdraw care.

Educational Objective: Advance directives are legal documents that enable patients to dictate their preferences for end-of-life care ahead of time. When patients become incapacitated, physicians should refer to the patient's advance directive for care instructions.

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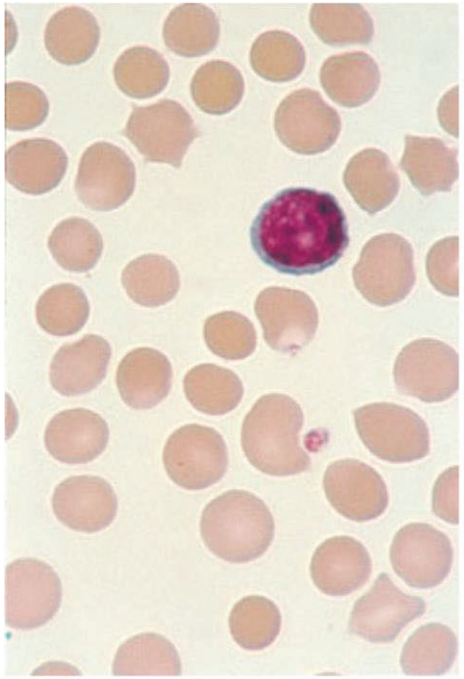
35. An 18-year-old woman comes to the physician because of a 3-day history of fatigue and yellow eyes. She has a history of mild anemia but is otherwise healthy. Her 16-year-old brother also has mild anemia. Her temperature is 36.7°C (98°F), pulse is 82/min, respirations are 14/min, and blood pressure is 105/60 mm Hg. There is scleral icterus. Examination shows multiple, 1-cm, cervical lymph nodes that are mildly tender. The spleen tip is palpated 3 cm below the left costal margin. Laboratory studies show:

Hemoglobin	8.6 g/dL
Mean corpuscular hemoglobin concentration	38% Hb/cell
Reticulocyte count	8%
Serum total bilirubin	3 mg/dL



A direct antiglobulin (Coombs) test is negative. A blood smear is shown. Which of the following is most likely to have prevented this patient's current symptoms?

A) Intravenous IgG therapy
B) Monthly transfusions of packed red blood cells
C) Prednisone therapy
D) Bone marrow transplant
E) Splenectomy
F) No preventive measures are efficacious

Correct Answer: E.

This patient with evidence of hemolytic anemia, increased reticulocyte count, and a family history of similar symptoms likely has hereditary spherocytosis (HS). HS can occur if there are mutations in one or more proteins that link the erythrocyte inner membrane skeleton to the outer lipid bilayer, and include mutations in spectrin, ankyrin, band 3, and band 4.2. These mutations are inherited in an autosomal dominant pattern. Spherocytosis results from the progressive loss of erythrocyte membrane over time and gives the erythrocytes a spherical shape as the surface area decreases but the volume of the cell remains unchanged. This impairs the erythrocyte's ability to

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D) Bone marrow transplant

E) Splenectomy

F) No preventive measures are efficacious

Correct Answer: E.

This patient with evidence of hemolytic anemia, increased reticulocyte count, and a family history of similar symptoms likely has hereditary spherocytosis (HS). HS can occur if there are mutations in one or more proteins that link the erythrocyte inner membrane skeleton to the outer lipid bilayer, and include mutations in spectrin, ankyrin, band 3, and band 4.2. These mutations are inherited in an autosomal dominant pattern. Spherocytosis results from the progressive loss of erythrocyte membrane over time and gives the erythrocytes a spherical shape as the surface area decreases but the volume of the cell remains unchanged. This impairs the erythrocyte's ability to conform in small vessels of the microcirculation, especially within the spleen, where spherocytes accumulate. Patients often present with splenomegaly, hemolytic anemia, and pigmented gallstones. Peripheral smear will demonstrate spherocytes, which are dense, dark cells with loss of central pallor. Reticulocytes may be seen during acute hemolytic episodes, which appear as larger, pale blue erythrocytes. Definitive management involves splenectomy.

Incorrect Answers: A, B, C, D, and F.

Intravenous IgG therapy (Choice A) and prednisone therapy (Choice C) are used in the treatment of acute autoimmune hemolytic anemia, but do not have a role in preventing hemolysis caused by HS.

Monthly transfusions of packed red blood cells (Choice B) are not routinely required for patients with chronic compensated HS. Red blood cell transfusions are indicated for a hemoglobin concentration less than 7.0 g/dL, which may occur during severe hemolytic flares or aplastic crises. Regular transfusions do not prevent the formation of abnormal erythrocytes susceptible to hemolysis.

Bone marrow transplant (Choice D) will theoretically prevent complications of HS as the transplanted erythrocyte progenitor cells should be lacking the causative mutations. However, bone marrow transplant is an invasive, high-risk procedure that has not been utilized in the treatment of HS except for rare cases in the setting of concurrent acute myelogenous leukemia.

No preventive measures are efficacious (Choice F) is incorrect. Splenectomy has been demonstrated to reduce the severity and frequency of hemolysis in patients with HS.

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This patient with evidence of hemolytic anemia, increased reticulocyte count, and a family history of similar symptoms likely has hereditary spherocytosis (HS). HS can occur if there are mutations in one or more proteins that link the erythrocyte inner membrane skeleton to the outer lipid bilayer, and include mutations in spectrin, ankyrin, band 3, and band 4.2. These mutations are inherited in an autosomal dominant pattern. Spherocytosis results from the progressive loss of erythrocyte membrane over time and gives the erythrocytes a spherical shape as the surface area decreases but the volume of the cell remains unchanged. This impairs the erythrocyte's ability to conform in small vessels of the microcirculation, especially within the spleen, where spherocytes accumulate. Patients often present with splenomegaly, hemolytic anemia, and pigmented gallstones. Peripheral smear will demonstrate spherocytes, which are dense, dark cells with loss of central pallor. Reticulocytes may be seen during acute hemolytic episodes, which appear as larger, pale blue erythrocytes. Definitive management involves splenectomy.

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Bone marrow transplant (Choice D) will theoretically prevent complications of HS as the transplanted erythrocyte progenitor cells should be lacking the causative mutations. However, bone marrow transplant is an invasive, high-risk procedure that has not been utilized in the treatment of HS except for rare cases in the setting of concurrent acute myelogenous leukemia.

No preventive measures are efficacious (Choice F) is incorrect. Splenectomy has been demonstrated to reduce the severity and frequency of hemolysis in patients with HS.

Educational Objective: Autosomal dominant mutations in ankyrin, spectrin, and band erythrocyte membrane proteins cause hereditary spherocytosis through loss of the normal connection between the inner membrane skeleton and the outer lipid bilayer. Clinical symptoms can include jaundice, splenomegaly, and anemia. Peripheral smear demonstrates spherocytes. Definitive treatment is with splenectomy.

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36. An 8-year-old boy is brought to the physician 1 hour after the sudden onset of facial swelling. He has had an upper respiratory tract infection and sore throat for the past 2 days. He has a history of six similar episodes since birth requiring hospitalization; two of the episodes required endotracheal intubation. All episodes presented the same except for one episode of facial swelling that began after he fell and cut his lip. He has no known allergies. His father, several paternal aunts, and some paternal cousins have had similar episodes. He appears anxious, and his voice is hoarse. His axillary temperature is 36.9°C (98.4°F), pulse is 110/min, respirations are 28/min, and blood pressure is 120/84 mm Hg. Examination shows edema of the lips and tongue; there is no tenderness, erythema, pain, or itching. Mild inspiratory stridor is heard. Which of the following serum studies is most likely to be abnormal?

A) Antinuclear antibodies
B) C1 esterase inhibitor
C) C8
D) Eosinophil count
E) IgA
F) IgE

Correct Answer: B.

Hereditary angioedema presents with intermittent episodes of swelling of the skin, face, and lips, as well as the mucosal lining of the respiratory and gastrointestinal system. It is caused by an autosomal dominant-inherited or de novo deficiency in C1 esterase inhibitor, which leads to overactivation of the complement system and overproduction of bradykinin. Bradykinin is a vasodilator that leads to the symptoms associated with hereditary angioedema. Episodes of angioedema can be caused by trauma, medications, and infections. They are not improved by antihistamines but commonly self-resolve. Further evaluation would also demonstrate a decreased C4 complement concentration and decreased concentration of serum C1 esterase inhibitor.

Incorrect Answers: A, C, D, E, and F.

Antinuclear antibodies (Choice A) are nonspecific autoantibodies that may display increased activity in the setting of various autoimmune disorders. Abnormal antinuclear antibody concentrations are often observed in systemic lupus erythematosus, antiphospholipid syndrome, Sjogren syndrome, mixed connective tissue disease,

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E) IgA

F) IgE

Correct Answer: B.

Hereditary angioedema presents with intermittent episodes of swelling of the skin, face, and lips, as well as the mucosal lining of the respiratory and gastrointestinal system. It is caused by an autosomal dominant-inherited or de novo deficiency in C1 esterase inhibitor, which leads to overactivation of the complement system and overproduction of bradykinin. Bradykinin is a vasodilator that leads to the symptoms associated with hereditary angioedema. Episodes of angioedema can be caused by trauma, medications, and infections. They are not improved by antihistamines but commonly self-resolve. Further evaluation would also demonstrate a decreased C4 complement concentration and decreased concentration of serum C1 esterase inhibitor.

Incorrect Answers: A, C, D, E, and F.

Antinuclear antibodies (Choice A) are nonspecific autoantibodies that may display increased activity in the setting of various autoimmune disorders. Abnormal antinuclear antibody concentrations are often observed in systemic lupus erythematosus, antiphospholipid syndrome, Sjogren syndrome, mixed connective tissue disease, scleroderma, dermatomyositis, and polymyositis. They are typically normal in hereditary angioedema.

C8 (Choice C) deficiency is associated with hereditary immunodeficiency characterized by ineffective formation of the membrane attack complex and susceptibility to *Neisseria* infections.

Eosinophil count (Choice D) is typically normal in hereditary angioedema. Eosinophilia is associated with allergic disorders such as asthma, drug hypersensitivity syndromes, and as a late finding in anaphylactic hypersensitivity reactions.

IgA (Choice E) and IgE (Choice F) concentrations are typically normal in hereditary angioedema. The vasodilatory response is driven by increased bradykinin concentration and not by IgE-mediated pathways as in type I hypersensitivity reactions.

Educational Objective: Hereditary angioedema presents with recurrent episodes of swelling of the skin, face, lips, respiratory tract, and gastrointestinal tract. It is caused by a deficiency in C1 esterase inhibitor, which leads to overactivation of the complement system and overproduction of bradykinin, a vasodilator.

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37. A 62-year-old man is brought to the emergency department 4 hours after the sudden onset of vomiting and severe abdominal pain. During the past year, he has had mild, intermittent epigastric pain, which is relieved with antacid use. He has no history of serious illness. He has smoked one and one-half packs of cigarettes daily for 35 years. He drinks one to two alcoholic beverages daily. He appears diaphoretic and is in acute distress. His temperature is 38.4°C (101.1°F), pulse is 100/min, respirations are 18/min, and blood pressure is 115/75 mm Hg. The abdomen is rigid and tympanitic to percussion over the liver. There is severe diffuse tenderness. Bowel sounds are absent. Which of the following is the most appropriate next step in diagnosis?

A) X-rays of the chest and abdomen
B) Barium enema
C) Water-soluble contrast swallow
D) CT scan of the abdomen
E) Colonoscopy
F) Flexible esophagogastroduodenoscopy

Correct Answer: A.

Fever, abdominal pain, peritonitis, and a history of intermittent epigastric pain relieved with antacid use raises suspicion for a perforated peptic ulcer. Patients with a perforated peptic ulcer can demonstrate intra-abdominal free air and leakage of enteric contents, resulting in inflammation, irritation, and infection of the peritoneum. A perforated viscus can occur secondary to peptic ulcer disease, diverticulitis, appendicitis, or blunt or penetrating abdominal trauma, among other causes. Expedient diagnostic imaging with upright x-rays of the chest and abdomen can show free air under the diaphragm to confirm diagnosis of a perforated viscus. A perforated peptic ulcer is a surgical emergency, and patients are treated with broad-spectrum antibiotics and surgery to repair the perforated viscus and lavage the peritoneal cavity.

Incorrect Answers: B, C, D, E, and F.

Barium enema (Choice B) and colonoscopy (Choice E) are used to examine abnormalities in the large intestine, such as colon cancer. They are not useful in the diagnosis of a perforated peptic ulcer disease, which is located in the upper gastrointestinal tract.

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E) Colonoscopy

F) Flexible esophagogastroduodenoscopy

Correct Answer: A.

Fever, abdominal pain, peritonitis, and a history of intermittent epigastric pain relieved with antacid use raises suspicion for a perforated peptic ulcer. Patients with a perforated peptic ulcer can demonstrate intra-abdominal free air and leakage of enteric contents, resulting in inflammation, irritation, and infection of the peritoneum. A perforated viscus can occur secondary to peptic ulcer disease, diverticulitis, appendicitis, or blunt or penetrating abdominal trauma, among other causes. Expedient diagnostic imaging with upright x-rays of the chest and abdomen can show free air under the diaphragm to confirm diagnosis of a perforated viscus. A perforated peptic ulcer is a surgical emergency, and patients are treated with broad-spectrum antibiotics and surgery to repair the perforated viscus and lavage the peritoneal cavity.

Incorrect Answers: B, C, D, E, and F.

Barium enema (Choice B) and colonoscopy (Choice E) are used to examine abnormalities in the large intestine, such as colon cancer. They are not useful in the diagnosis of a perforated peptic ulcer disease, which is located in the upper gastrointestinal tract.

A water-soluble contrast swallow (Choice C) can be used in the evaluation of upper gastrointestinal anatomy such as for esophageal stricture, perforation, achalasia, hiatal hernia, fistula, or cause of dysphagia. It would also be contraindicated in this patient who is vomiting as water-soluble contrast can cause pneumonitis if aspirated.

CT scan of the abdomen (Choice D) is a sensitive and specific imaging modality for many acute intra-abdominal processes and can help with surgical planning in patients with perforated peptic ulcer disease. However, x-rays of the chest and abdomen are more quickly obtained and can help with expedient diagnosis of this surgical emergency.

Flexible esophagogastroduodenoscopy (Choice F) can be helpful in the diagnosis of peptic ulcer disease as well as allow for treatment during the procedure. However, once a peptic ulcer has perforated, esophagogastroduodenoscopy is contraindicated.

Educational Objective: A perforated peptic ulcer is a surgical emergency and rapid diagnosis is necessary to expedite management of these patients. Upright x-rays of the chest and abdomen are quick and can be obtained at bedside, especially in patients who are unstable or are in acute distress.

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38. A 6-year-old boy is brought to the physician by his parents because of a 3-day history of progressive pain, swelling, and redness around his right eye. The swelling began on his right upper eyelid and has now spread to the whole eye. He says that it hurts when he moves his eyes. He also has had fever and headache during this period. He has a 2-week history of cough and nasal congestion. He takes no medications. Immunizations are up-to-date. His temperature is 38.1°C (100.6°F), pulse is 110/min, respirations are 22/min, and blood pressure is 130/70 mm Hg. Examination shows exophthalmos of the right eye; the upper and lower eyelids are erythematous and edematous. The erythema does not extend beyond the superior orbital rim. He cannot fully abduct his right eye on lateral gaze. The remainder of the examination shows no abnormalities. A CT scan of the head is shown. Which of the following is the most likely diagnosis?

A) Glaucoma
B) Neuroblastoma
C) Orbital cellulitis
D) Preseptal (periorbital) cellulitis
E) Retinoblastoma

Correct Answer: C.

Orbital cellulitis results from infection of the soft tissues posterior to the orbital septum, a layer of connective tissue that extends from the periosteum of the orbital rim to the tissues of the eyelids. Orbital cellulitis is a medical emergency because infections posterior to the septum may cause irreversible damage to the optic nerve and carry greater risk for spread to the cavernous sinus and central nervous system, which may result in cavernous sinus thrombosis, meningitis, or death. Gram-positive organisms such as *S. aureus* or *S. pneumoniae* are most common, although *H. influenzae* is found more frequently in children. In most patients, including in children, orbital cellulitis typically results from local spread of bacteria from an adjacent infection of the paranasal sinuses (particularly the ethmoid air cells), upper respiratory tract, or dental

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D) Preseptal (periorbital) cellulitis

E) Retinoblastoma

Correct Answer: C.

Orbital cellulitis results from infection of the soft tissues posterior to the orbital septum, a layer of connective tissue that extends from the periosteum of the orbital rim to the tissues of the eyelids. Orbital cellulitis is a medical emergency because infections posterior to the septum may cause irreversible damage to the optic nerve and carry greater risk for spread to the cavernous sinus and central nervous system, which may result in cavernous sinus thrombosis, meningitis, or death. Gram-positive organisms such as *S. aureus* or *S. pneumoniae* are most common, although *H. influenzae* is found more frequently in children. In most patients, including in children, orbital cellulitis typically results from local spread of bacteria from an adjacent infection of the paranasal sinuses (particularly the ethmoid air cells), upper respiratory tract, or dental infection. Other causes of orbital cellulitis include orbital trauma, ocular or periocular surgery, or hematogenous dissemination. Patients with orbital cellulitis present with signs and symptoms including fever, pain, and erythema, swelling, and warmth of the orbit. The eye may be proptotic and demonstrate reduced mobility, as well as pain with extraocular movements. Optic nerve dysfunction may be suggested by the presence of reduced color perception, a relative afferent pupillary defect, or optic disc edema. Patients in whom orbital cellulitis is suspected should undergo an emergent CT scan to confirm the presence of an orbital infection and to evaluate for the presence of a subperiosteal abscess. They should also begin immediate treatment with broad-spectrum intravenous antibiotics.

Incorrect Answers: A, B, D, and E.

Glaucoma (Choice A), when occurring as acute angle closure glaucoma, presents with pain, conjunctival injection, a fixed, mid-dilated pupil, increased intraocular pressure, and no visible fundus abnormalities. It does not present with fever and does not cause proptosis or swelling of the orbital soft tissues.

Neuroblastoma (Choice B) is a malignancy of neuroendocrine cells associated with sympathetic nervous tissue. It may present with proptosis in the setting of orbital metastasis. In this patient, the acute onset of symptoms, presence of fever, history of recent upper respiratory tract infection, and opacification of the ethmoid air cells on the CT scan are more suggestive of orbital cellulitis.

Preseptal (periorbital) cellulitis (Choice D) is characterized by infection anterior to the orbital septum. It may present with periocular pain and swelling but does not cause proptosis or pain with extraocular eye movements. This patient's CT scan also shows the presence of a right orbital subperiosteal abscess along the medial orbital wall adjacent to the ethmoid air cells, confirming the presence of orbital cellulitis.

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typically results from local spread of bacteria from an adjacent infection of the paranasal sinuses (particularly the ethmoid air cells), upper respiratory tract, or dental infection. Other causes of orbital cellulitis include orbital trauma, ocular or periocular surgery, or hematogenous dissemination. Patients with orbital cellulitis present with signs and symptoms including fever, pain, and erythema, swelling, and warmth of the orbit. The eye may be proptotic and demonstrate reduced mobility, as well as pain with extraocular movements. Optic nerve dysfunction may be suggested by the presence of reduced color perception, a relative afferent pupillary defect, or optic disc edema. Patients in whom orbital cellulitis is suspected should undergo an emergent CT scan to confirm the presence of an orbital infection and to evaluate for the presence of a subperiosteal abscess. They should also begin immediate treatment with broad-spectrum intravenous antibiotics.

Incorrect Answers: A, B, D, and E.

Glaucoma (Choice A), when occurring as acute angle closure glaucoma, presents with pain, conjunctival injection, a fixed, mid-dilated pupil, increased intraocular pressure, and no visible fundus abnormalities. It does not present with fever and does not cause proptosis or swelling of the orbital soft tissues.

Neuroblastoma (Choice B) is a malignancy of neuroendocrine cells associated with sympathetic nervous tissue. It may present with proptosis in the setting of orbital metastasis. In this patient, the acute onset of symptoms, presence of fever, history of recent upper respiratory tract infection, and opacification of the ethmoid air cells on the CT scan are more suggestive of orbital cellulitis.

Preseptal (periorbital) cellulitis (Choice D) is characterized by infection anterior to the orbital septum. It may present with periocular pain and swelling but does not cause proptosis or pain with extraocular eye movements. This patient's CT scan also shows the presence of a right orbital subperiosteal abscess along the medial orbital wall adjacent to the ethmoid air cells, confirming the presence of orbital cellulitis.

Retinoblastoma (Choice E) is a malignant proliferation of retinal neuroendocrine cells and is the most common ophthalmic malignancy in children. Children may present with unilateral or bilateral leukocoria and associated reduced vision. Retinoblastoma tends to metastasize through the optic nerve, rather than into the orbit itself, and rarely presents with orbital inflammation or proptosis.

Educational Objective: Orbital cellulitis results from infection of the soft tissues posterior to the orbital septum. Orbital cellulitis typically occurs secondary to the local spread of bacteria from an adjacent infection of the paranasal sinuses, upper respiratory tract, or dental infection. Patients in whom orbital cellulitis is suspected should undergo emergent CT scan to confirm the presence of orbital infection and to evaluate for the presence of a subperiosteal abscess. They should also begin immediate treatment with broad-spectrum intravenous antibiotics.

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39. A 47-year-old woman comes to the physician for a routine health maintenance examination. She has a 2-year history of venous insufficiency and notes daily swelling of her ankles that worsens in the evening. She takes no medications. Her pulse is 80/min, and blood pressure is 160/100 mm Hg. Cardiopulmonary examination shows no abnormalities. Examination of the lower extremities shows 2+ edema and increased pigmentation. Which of the following antihypertensive drugs would most likely exacerbate this patient's swelling?

A) Atenolol
B) Clonidine
C) Lisinopril
D) Losartan
E) Nifedipine

Correct Answer: E.

Dihydropyridine calcium-channel blocking (CCB) agents, such as nifedipine or amlodipine, are potent arteriolar vasodilators that reduce blood pressure by decreasing vascular peripheral resistance. Calcium-channel blockers, in general, inhibit L-type calcium channels on smooth muscle cells and cardiomyocytes, decreasing the transmembrane calcium current and resulting in vasodilation and decreased cardiomyocyte contractility. The dihydropyridine CCBs have minimal cardiomyocyte activity and primarily act on vascular smooth muscle cells. CCBs may exacerbate peripheral edema, which is one of the most common causes for discontinuation of CCB treatment. CCBs may also cause headache, lightheadedness, facial flushing, and gingival hyperplasia.

Incorrect Answers: A, B, C, and D.

Atenolol (Choice A) is a cardioselective β-adrenergic blocker. It may exacerbate symptoms of heart failure in patients with aortic stenosis by reducing ejection fraction but does not typically cause peripheral edema.

Clonidine (Choice B) is an α_2-adrenergic agonist that results in decreased sympathetic outflow with consequent relaxation of vascular tone. Adverse effects include orthostatic hypotension, sedation, and bradycardia. There is also a risk for rebound hypertension when the medication is stopped.

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C) Lisinopril

D) Losartan

E) Nifedipine

Correct Answer: E.

Dihydropyridine calcium-channel blocking (CCB) agents, such as nifedipine or amlodipine, are potent arteriolar vasodilators that reduce blood pressure by decreasing vascular peripheral resistance. Calcium-channel blockers, in general, inhibit L-type calcium channels on smooth muscle cells and cardiomyocytes, decreasing the transmembrane calcium current and resulting in vasodilation and decreased cardiomyocyte contractility. The dihydropyridine CCBs have minimal cardiomyocyte activity and primarily act on vascular smooth muscle cells. CCBs may exacerbate peripheral edema, which is one of the most common causes for discontinuation of CCB treatment. CCBs may also cause headache, lightheadedness, facial flushing, and gingival hyperplasia.

Incorrect Answers: A, B, C, and D.

Atenolol (Choice A) is a cardioselective β-adrenergic blocker. It may exacerbate symptoms of heart failure in patients with aortic stenosis by reducing ejection fraction but does not typically cause peripheral edema.

Clonidine (Choice B) is an α_2-adrenergic agonist that results in decreased sympathetic outflow with consequent relaxation of vascular tone. Adverse effects include orthostatic hypotension, sedation, and bradycardia. There is also a risk for rebound hypertension when the medication is stopped.

Lisinopril (Choice C) is an ACE-inhibitor used for the management of heart failure, hypertension, and diabetic nephropathy. Potential adverse effects include acute kidney injury, hyperkalemia, cough, and angioedema. It does not typically cause peripheral edema.

Losartan (Choice D) is an angiotensin II receptor blocker used for the management of hypertension and heart failure. It may lead to hypotension and hyperkalemia but does not cause peripheral edema.

Educational Objective: Dihydropyridine calcium-channel blocking agents, such as nifedipine or amlodipine, are potent arteriolar vasodilators that reduce blood pressure by decreasing vascular peripheral resistance. CCBs may exacerbate peripheral edema, which is one of the most common causes for discontinuation of CCB treatment.

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40. An asymptomatic 37-year-old woman comes to the physician for a routine health maintenance examination. She has a history of asthma exacerbated by nonsteroidal anti-inflammatory drugs. She has smoked two packs of cigarettes daily for 20 years. Her current medications include inhaled isoetharine and an oral contraceptive. She is 152 cm (5 ft) tall and weighs 50 kg (110 lb); BMI is 22 kg/m^2. Her blood pressure is 140/88 mm Hg. Examination shows no abnormalities. Which of the following is the most appropriate recommendation to prevent stroke in this patient?

A) Initiate an exercise program
B) Discontinue the bronchodilator
C) Discontinue the oral contraceptive
D) Initiate antihypertensive therapy
E) Take one aspirin daily

Correct Answer: C.

Oral contraceptives are an effective form of birth control but are associated with significant adverse effects, including an increased risk for venous thromboembolism, myocardial infarction, and stroke. The risk for stroke is increased particularly in older patients who smoke. The Centers for Disease Control and the World Health Organization have provided recommendations regarding absolute contraindications for the use of oral contraceptives, including an age greater than 35 years and currently smoking greater than 15 cigarettes daily, uncontrolled hypertension, women with a history of hypercoagulability or prior venous thromboembolism or stroke, or a history of particular medical conditions (eg, migraine with aura, breast or liver cancer, cirrhosis, coronary vascular disease, or valvular heart disease). This patient aged greater than 35 years who smokes greater than 15 cigarettes daily should discontinue her oral contraceptive. Other contraceptive options can be considered as an alternative, such as a copper IUD.

Incorrect Answers: A, B, D, and E.

Initiating an exercise program (Choice A) is an important component of general health and may decrease the risk for stroke by improving cardiovascular health and reducing blood pressure. This intervention is not as important, however, in this patient with a history of smoking and oral contraceptive use.

Discontinuing the bronchodilator (Choice B) is not necessary. Isoetharine is a short-acting β-adrenergic agonist that is not commonly used in the current treatment of

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E) Take one aspirin daily

Correct Answer: C.

Oral contraceptives are an effective form of birth control but are associated with significant adverse effects, including an increased risk for venous thromboembolism, myocardial infarction, and stroke. The risk for stroke is increased particularly in older patients who smoke. The Centers for Disease Control and the World Health Organization have provided recommendations regarding absolute contraindications for the use of oral contraceptives, including an age greater than 35 years and currently smoking greater than 15 cigarettes daily, uncontrolled hypertension, women with a history of hypercoagulability or prior venous thromboembolism or stroke, or a history of particular medical conditions (eg, migraine with aura, breast or liver cancer, cirrhosis, coronary vascular disease, or valvular heart disease). This patient aged greater than 35 years who smokes greater than 15 cigarettes daily should discontinue her oral contraceptive. Other contraceptive options can be considered as an alternative, such as a copper IUD.

Incorrect Answers: A, B, D, and E.

Initiating an exercise program (Choice A) is an important component of general health and may decrease the risk for stroke by improving cardiovascular health and reducing blood pressure. This intervention is not as important, however, in this patient with a history of smoking and oral contraceptive use.

Discontinuing the bronchodilator (Choice B) is not necessary. Isoetharine is a short-acting β-adrenergic agonist that is not commonly used in the current treatment of asthma. β-Adrenergic agonists are not known to be associated with an increased risk for stroke when used in combination with oral contraceptives.

Initiating antihypertensive therapy (Choice D) may be indicated for this patient who presents with hypertension. However, stopping her oral contraceptive will have a greater impact on her risk for stroke.

Daily aspirin (Choice E) is not currently recommended by the American Heart Association or the American College of Cardiology for patients without a history of stroke or known cardiovascular disease because of the lack of proven benefit in prevention of a first stroke as well as an increased risk for bleeding.

Educational Objective: Oral contraceptives are an effective form of birth control but are associated with significant adverse effects, including an increased risk for venous thromboembolism, myocardial infarction, and stroke. The risk for stroke is increased particularly in patients older than age 35 years who smoke greater than 15 cigarettes daily. These circumstances represent a contraindication to further continuation of an oral contraceptive.

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41. A 62-year-old woman, gravida 2, para 2, comes to the physician because of loss of urine that has become progressively worse during the past 3 months. She has a 5-year history of occasional incontinence after feeling a strong urge to void; treatment with oxybutynin has provided no relief of her symptoms. She has type 2 diabetes mellitus and hypertension. Current medications include metformin, insulin, and metoprolol. Vital signs are within normal limits. Abdominal examination shows no abnormalities. The external genitalia, vagina, and cervix appear normal. The uterus and adnexa are normal to palpation. There is loss of a large amount of urine with mild pressure on Valsalva maneuver. Her postvoid residual volume is 500 mL. Urinalysis shows no abnormalities. Which of the following is the most likely diagnosis?

A) Overactive bladder with incontinence
B) Overflow incontinence
C) Stress incontinence
D) Urinary tract infection
E) Vesicovaginal fistula

Correct Answer: B.

Overflow incontinence occurs when bladder emptying is impaired, eventually resulting in intravesical hydrostatic pressure overcoming internal and external urinary sphincter closing pressures, thereby causing the leakage of urine. It can occur due to a variety of causes, including neurologic insults (eg, diabetic neuropathy, stroke, trauma, multiple sclerosis) that result in bladder atony and bladder outlet obstruction secondary to benign prostatic hyperplasia or a bladder mass. Patients develop urinary retention with an inability to void and may display loss of urine with Valsalva or increased abdominopelvic pressure. The diagnosis is established with a urodynamic study, which typically discloses an increased postvoid residual volume. In contrast to an overactive bladder, which is treated with oxybutynin, overflow incontinence is treated with bethanechol, a muscarinic agent that promotes bladder contraction, or with intermittent catheterization.

Incorrect Answers: A, C, D, and E.

Overactive bladder with incontinence (Choice A) is caused by detrusor muscle instability and commonly results in urge incontinence, which presents with the urge to void followed shortly by the leakage of urine. Oxybutynin is an antimuscarinic medication used to treat urge incontinence from an overactive bladder and detrusor instability.

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E) Vesicovaginal fistula

Correct Answer: B.

Overflow incontinence occurs when bladder emptying is impaired, eventually resulting in intravesical hydrostatic pressure overcoming internal and external urinary sphincter closing pressures, thereby causing the leakage of urine. It can occur due to a variety of causes, including neurologic insults (eg, diabetic neuropathy, stroke, trauma, multiple sclerosis) that result in bladder atony and bladder outlet obstruction secondary to benign prostatic hyperplasia or a bladder mass. Patients develop urinary retention with an inability to void and may display loss of urine with Valsalva or increased abdominopelvic pressure. The diagnosis is established with a urodynamic study, which typically discloses an increased postvoid residual volume. In contrast to an overactive bladder, which is treated with oxybutynin, overflow incontinence is treated with bethanechol, a muscarinic agent that promotes bladder contraction, or with intermittent catheterization.

Incorrect Answers: A, C, D, and E.

Overactive bladder with incontinence (Choice A) is caused by detrusor muscle instability and commonly results in urge incontinence, which presents with the urge to void followed shortly by the leakage of urine. Oxybutynin is an antimuscarinic medication used to treat urge incontinence from an overactive bladder and detrusor instability.

Stress incontinence (Choice C) is incontinence that is triggered by an increase in intra-abdominal pressure (eg, lifting, sneezing, Valsalva). Stress incontinence results from urethral hypermobility caused by pelvic floor weakness/prolapse or intrinsic sphincter deficiency. Risk factors include multiple vaginal deliveries, obesity, and prostate surgery.

Urinary tract infection (Choice D) can present with an overactive bladder (frequency, urgency, urge incontinence). Patients generally also experience dysuria and suprapubic pain. The presence of bacteria and white blood cells on urinalysis is typical.

Vesicovaginal fistula (Choice E) can be a consequence of gynecologic surgery, pelvic malignancy, or radiation therapy. It typically presents with painless urinary leakage from the bladder into the vagina and on pelvic examination a pool of urine is typically present in the vaginal canal.

Educational Objective: Overflow incontinence occurs when bladder emptying is impaired, eventually resulting in intravesical hydrostatic pressure overcoming internal and external urinary sphincter closing pressures, thereby causing the leakage of urine. Common causes include neurologic insults, such as diabetic neuropathy and bladder outlet obstruction. An increased postvoid residual volume is a characteristic finding.

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42. A 62-year-old man comes to the physician because of a 1-year history of progressive shortness of breath. He has moderate difficulty breathing at rest and has wheezing after walking 20 feet. He has a chronic cough productive of white sputum that occurred intermittently for 10 years and then started to occur daily 1 year ago. He has not had any other symptoms. He has no other history of serious medical conditions and takes no medications. He has smoked one pack of cigarettes daily for 47 years. His temperature is 37.1°C (98.7°F), pulse is 76/min, respirations are 28/min, and blood pressure is 130/70 mm Hg while sitting. Pulse oximetry on room air shows an oxygen saturation of 92%. Examination shows no jugular venous distention. Expiratory wheezes are heard bilaterally. Cardiac examination shows no abnormalities. Carotid and femoral pulses are 2+. There is no peripheral edema. Spirometry shows a decreased FEV_1 and FEV_1:FVC ratio. An ECG shows no abnormalities. A chest x-ray shows an increased anteroposterior diameter. The physician counsels the patient about beginning a smoking cessation program. Which of the following is the most appropriate next step in management?

A) CT scan of the chest
B) Prednisone therapy
C) Theophylline therapy
D) Oxygen therapy
E) Use of an ipratropium inhaler

Correct Answer: E.

Chronic obstructive pulmonary disease (COPD) is an obstructive lung disease characterized by decreased lung function from a combination of chronic bronchitis and/or emphysema, resulting in airflow obstruction on expiration. Physical examination discloses decreased breath sounds caused by reduced airflow and a prolonged expiratory phase as the pathologically narrowed airways are further compressed by positive intrathoracic pressure during expiration. Heart sounds may be distant secondary to emphysematous lung changes (sound is transmitted poorly through air relative to normal lung tissue). Pulmonary abnormalities can be evaluated by pulmonary function testing, which includes spirometry, full-body plethysmography, single-breath diffusing capacity, arterial blood gas analysis, and pulse oximetry. Spirometry is the most useful in diagnosing obstructive lung disease, which is defined by a decrease in the ratio of the volume of air forcefully expelled in the first second of expiration to the total volume of air expelled during the expiratory phase (FEV_1/FVC). The severity of obstruction is graded by the amount of FEV_1 reduction compared to predicted values. Treatment is focused on smoking cessation and supplemental oxygen to decreased mortality. Symptoms are managed with inhaled short-acting β-adrenergic agonists, long-acting β-adrenergic agonists, muscarinic antagonists (such as ipratropium), and glucocorticoids. The most appropriate recommendation at this time is to initiate the

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D) Oxygen therapy

E) Use of an ipratropium inhaler

Correct Answer: E.

Chronic obstructive pulmonary disease (COPD) is an obstructive lung disease characterized by decreased lung function from a combination of chronic bronchitis and/or emphysema, resulting in airflow obstruction on expiration. Physical examination discloses decreased breath sounds caused by reduced airflow and a prolonged expiratory phase as the pathologically narrowed airways are further compressed by positive intrathoracic pressure during expiration. Heart sounds may be distant secondary to emphysematous lung changes (sound is transmitted poorly through air relative to normal lung tissue). Pulmonary abnormalities can be evaluated by pulmonary function testing, which includes spirometry, full-body plethysmography, single-breath diffusing capacity, arterial blood gas analysis, and pulse oximetry. Spirometry is the most useful in diagnosing obstructive lung disease, which is defined by a decrease in the ratio of the volume of air forcefully expelled in the first second of expiration to the total volume of air expelled during the expiratory phase (FEV_1/FVC). The severity of obstruction is graded by the amount of FEV_1 reduction compared to predicted values. Treatment is focused on smoking cessation and supplemental oxygen to decreased mortality. Symptoms are managed with inhaled short-acting β-adrenergic agonists, long-acting β-adrenergic agonists, muscarinic antagonists (such as ipratropium), and glucocorticoids. The most appropriate recommendation at this time is to initiate the use of an ipratropium inhaler.

Incorrect Answers: A, B, C, and D.

CT scan of the chest (Choice A) is not needed for the routine diagnosis of COPD. Imaging is commonly utilized to assess for complications of COPD when a change in clinical status occurs, such as pneumonia or pneumothorax caused by emphysematous bullae. A smoking history is common in patients with COPD, and lung cancer screening with low dose chest CT is recommended for certain populations.

Prednisone therapy (Choice B) is typically utilized in the treatment of acute COPD exacerbations for short durations to reduce the inflammatory component of the airway response. However, inhaled corticosteroids are preferred over systemic steroids for chronic stable symptom management.

Theophylline therapy (Choice C) is an inexpensive and historically common treatment for COPD; however, its use has fallen out of favor because of decreased effectiveness and increased risk for adverse effects compared to currently recommended therapies.

Oxygen therapy (Choice D) is recommended for chronic hypoxemia, defined as an arterial oxygen tension less than or equal to 55 mm Hg or a peripheral oxygen saturation of less than or equal to 88%. Long-term supplemental oxygen therapy has been shown to increase survival and improve quality of life for patients with chronic

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emphysema, resulting in airflow obstruction on expiration. Physical examination discloses decreased breath sounds caused by reduced airflow and a prolonged expiratory phase as the pathologically narrowed airways are further compressed by positive intrathoracic pressure during expiration. Heart sounds may be distant secondary to emphysematous lung changes (sound is transmitted poorly through air relative to normal lung tissue). Pulmonary abnormalities can be evaluated by pulmonary function testing, which includes spirometry, full-body plethysmography, single-breath diffusing capacity, arterial blood gas analysis, and pulse oximetry. Spirometry is the most useful in diagnosing obstructive lung disease, which is defined by a decrease in the ratio of the volume of air forcefully expelled in the first second of expiration to the total volume of air expelled during the expiratory phase (FEV_1/FVC). The severity of obstruction is graded by the amount of FEV_1 reduction compared to predicted values. Treatment is focused on smoking cessation and supplemental oxygen to decreased mortality. Symptoms are managed with inhaled short-acting β-adrenergic agonists, long-acting β-adrenergic agonists, muscarinic antagonists (such as ipratropium), and glucocorticoids. The most appropriate recommendation at this time is to initiate the use of an ipratropium inhaler.

Incorrect Answers: A, B, C, and D.

CT scan of the chest (Choice A) is not needed for the routine diagnosis of COPD. Imaging is commonly utilized to assess for complications of COPD when a change in clinical status occurs, such as pneumonia or pneumothorax caused by emphysematous bullae. A smoking history is common in patients with COPD, and lung cancer screening with low dose chest CT is recommended for certain populations.

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Theophylline therapy (Choice C) is an inexpensive and historically common treatment for COPD; however, its use has fallen out of favor because of decreased effectiveness and increased risk for adverse effects compared to currently recommended therapies.

Oxygen therapy (Choice D) is recommended for chronic hypoxemia, defined as an arterial oxygen tension less than or equal to 55 mm Hg or a peripheral oxygen saturation of less than or equal to 88%. Long-term supplemental oxygen therapy has been shown to increase survival and improve quality of life for patients with chronic hypoxemia caused by COPD.

Educational Objective: COPD is an obstructive lung disease associated with tobacco use characterized by airflow obstruction. Chronic symptoms are improved with the use of inhaled long-acting β-adrenergic agonists, inhaled muscarinic antagonists, and inhaled glucocorticoids.

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43. A previously healthy 2-year-old girl is brought to the emergency department by her parents 60 minutes after she had a 2-minute episode of generalized shaking. During the episode, she was unresponsive, and her eyes were rolled back in her head. On arrival, she is awake and cooperative. Her temperature is 39.8°C (103.6°F), pulse is 130/min, respirations are 12/min, and blood pressure is 90/70 mm Hg. Examination shows an erythematous, bulging right tympanic membrane. The neck is supple. Neurologic examination shows no focal findings. Serum electrolyte concentrations are within normal limits. Which of the following is the most appropriate next step in management?

A) CT scan of the head
B) Oral antibiotic therapy
C) Mastoidectomy
D) Intravenous phenobarbital therapy
E) Lumbar puncture

Correct Answer: B.

This child's generalized tonic-clonic seizure, which occurred in the setting of a febrile illness, is consistent with a diagnosis of simple febrile seizure. Febrile seizures typically occur in children between the ages of 6 months and 5 years and may be simple (generalized and lasting for less than 15 minutes) or complex (focal, recurrent, or lasting longer than 15 minutes). The majority of febrile seizures are simple, and neither require treatment nor carry a significantly increased risk for future epilepsy. A careful history and physical examination are necessary to distinguish benign, febrile seizures from complex seizures resulting from viral or bacterial central nervous system infections. While no antiepileptic treatment is required for a simple febrile seizure, management should include antibiotics for the patient's acute otitis media and antipyretics.

Incorrect Answers: A, C, D, and E.

CT scan of the head (Choice A) would be appropriate in a child with an abnormal neurologic examination or focal findings on examination. Simple febrile seizures are common and require no further diagnostic testing.

Mastoidectomy (Choice C) may be indicated in cases of mastoiditis, which can result from untreated acute otitis media and presents with mastoid tenderness, erythema

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D) Intravenous phenobarbital therapy

E) Lumbar puncture

Correct Answer: B.

This child's generalized tonic-clonic seizure, which occurred in the setting of a febrile illness, is consistent with a diagnosis of simple febrile seizure. Febrile seizures typically occur in children between the ages of 6 months and 5 years and may be simple (generalized and lasting for less than 15 minutes) or complex (focal, recurrent, or lasting longer than 15 minutes). The majority of febrile seizures are simple, and neither require treatment nor carry a significantly increased risk for future epilepsy. A careful history and physical examination are necessary to distinguish benign, febrile seizures from complex seizures resulting from viral or bacterial central nervous system infections. While no antiepileptic treatment is required for a simple febrile seizure, management should include antibiotics for the patient's acute otitis media and antipyretics.

Incorrect Answers: A, C, D, and E.

CT scan of the head (Choice A) would be appropriate in a child with an abnormal neurologic examination or focal findings on examination. Simple febrile seizures are common and require no further diagnostic testing.

Mastoidectomy (Choice C) may be indicated in cases of mastoiditis, which can result from untreated acute otitis media, and presents with mastoid tenderness, erythema, and bulging on examination. This patient likely has acute otitis media and has no signs of mastoiditis.

Intravenous phenobarbital therapy (Choice D) would be inappropriate in a patient with a simple febrile seizure because they are associated with a febrile illness and caused by epilepsy.

Lumbar puncture (Choice E) would be indicated if there was a suspicion for meningitis, which can present in children with fever, altered mental status, lethargy, nuchal rigidity, and petechial rash.

Educational Objective: Simple febrile seizures do not require treatment or invasive testing. If simple febrile seizures occur in the setting of a bacterial infection, antibiotics should be prescribed for management of the infection.

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44. A 27-year-old man is brought to the emergency department by police after being found somnolent in an alley. On arrival, he is agitated and confused. When staff approach him, he shouts and tries to get off the stretcher. He appears disheveled. He is malodorous and diaphoretic. He rambles unintelligibly on questioning and persistently picks at his clothes. His pulse is 110/min, and blood pressure is 160/90 mm Hg. Pupils are equal and reactive. He has a mild tremor of both hands. Urine toxicology screening is negative. Which of the following is the most likely cause of this patient's symptoms?

A) Alcohol intoxication
B) Alcohol withdrawal
C) Cocaine intoxication
D) Cocaine withdrawal
E) Opioid intoxication
F) Opioid withdrawal

Correct Answer: B.

Alcohol increases the central nervous system activity of γ-aminobutyric acid (GABA), the main inhibitory neurotransmitter. Abrupt discontinuation of alcohol therefore leads to sympathetic overdrive. Uncomplicated alcohol withdrawal typically presents with tremors, anxiety, restlessness, headache, nausea, and diaphoresis, which can occur hours after the cessation of alcohol use. Delirium tremens, the most concerning and life-threatening complication of alcohol withdrawal, involves severe confusion and disorientation, fluctuations in consciousness, agitation, visual hallucinations, and autonomic instability (fluctuations in pulse, blood pressure, and temperature). Alcohol withdrawal is managed supportively with benzodiazepines to address agitation and prevent the symptoms of withdrawal, intravenous fluids, nutritional supplementation, and frequent assessment including vital sign checks. Other complications of alcohol withdrawal include alcoholic hallucinosis (auditory or visual hallucinations without confusion or autonomic instability) and seizures.

Incorrect Answers: A, C, D, E, and F.

Alcohol intoxication (Choice A) can cause slurred speech, emotional lability, behavioral disinhibition, disorientation, altered mental status, ataxia, and memory lapses.

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F) Opioid withdrawal

Correct Answer: B.

Alcohol increases the central nervous system activity of γ-aminobutyric acid (GABA), the main inhibitory neurotransmitter. Abrupt discontinuation of alcohol therefore leads to sympathetic overdrive. Uncomplicated alcohol withdrawal typically presents with tremors, anxiety, restlessness, headache, nausea, and diaphoresis, which can occur hours after the cessation of alcohol use. Delirium tremens, the most concerning and life-threatening complication of alcohol withdrawal, involves severe confusion and disorientation, fluctuations in consciousness, agitation, visual hallucinations, and autonomic instability (fluctuations in pulse, blood pressure, and temperature). Alcohol withdrawal is managed supportively with benzodiazepines to address agitation and prevent the symptoms of withdrawal, intravenous fluids, nutritional supplementation, and frequent assessment including vital sign checks. Other complications of alcohol withdrawal include alcoholic hallucinosis (auditory or visual hallucinations without confusion or autonomic instability) and seizures.

Incorrect Answers: A, C, D, E, and F.

Alcohol intoxication (Choice A) can cause slurred speech, emotional lability, behavioral disinhibition, disorientation, altered mental status, ataxia, and memory lapses.

Cocaine intoxication (Choice C) presents with euphoria and increased sympathetic tone, restlessness, tachycardia, hypertension, and pupillary dilation. Cocaine would likely be detected on a urine toxicology assay.

Cocaine withdrawal (Choice D) presents with fatigue, depression, anxiety, cravings, restlessness, cramping, and irritability.

Opioid intoxication (Choice E) typically presents with miosis, depressed mental state, and depressed respiratory drive. Opioid overdose can cause apnea and hypoxic cardiorespiratory arrest.

Opioid withdrawal (Choice F) causes symptoms such as restlessness, tachycardia, hypertension, tremors, nausea, and vomiting. However, opioid withdrawal typically also presents with lacrimation, rhinorrhea, piloerection, and yawning.

Educational Objective: Alcohol withdrawal commonly presents with tremors, anxiety, restlessness, headache, nausea, diaphoresis, and autonomic instability with tachycardia and hypertension. Seizures and delirium can also occur.

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45. A 16-year-old boy comes to the physician for a routine follow-up examination. He has a 10-year history of type 1 diabetes mellitus. During the past 9 months, he has not been compliant with his treatment; he has been missing insulin injections and has not been monitoring his blood glucose concentrations. He has been admitted to the hospital four times during the past 3 years for diabetic ketoacidosis; his hemoglobin A_{1c} during each hospital stay was greater than 10%. His pulse is 68/min, and blood pressure is 122/85 mm Hg. Examination shows lipoatrophy at the abdominal injection sites. Funduscopic examination shows no abnormalities. Which of the following is the most appropriate next step?

A) Measurement of serum fructosamine concentration
B) Measurement of urine microalbumin concentration
C) Liver function tests
D) Thyroid function tests
E) ECG

Correct Answer: B.

This patient has poorly controlled diabetes mellitus, as demonstrated by several hospitalizations, non-adherence with treatment, and severely increased concentrations of hemoglobin A_{1c}. Long-standing hyperglycemia such as in this patient can lead to complications such as diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles, resulting in thickening of the basement membrane along with compromise of the filtration barrier resulting in increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole occurs, which can actually increase glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson lesions, on light microscopy. The combination of increased permeability and increased GFR progresses over time in patients with diabetes mellitus, initially beginning as microalbuminuria, progressing to macroalbuminuria, and eventually to end-stage renal disease. Measurement of urine microalbumin concentration can help with the diagnosis of early diabetic nephropathy and direct management of diabetes mellitus.

Incorrect Answers: A, C, D, and E.

Serum fructosamine (Choice A) is a measurement of glycated protein in the blood, similar to the measurement of serum hemoglobin A_{1c}. It correlates with concentration of

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D) Thyroid function tests

E) ECG

Correct Answer: B.

This patient has poorly controlled diabetes mellitus, as demonstrated by several hospitalizations, non-adherence with treatment, and severely increased concentrations of hemoglobin A_{1c}. Long-standing hyperglycemia such as in this patient can lead to complications such as diabetic nephropathy. The pathophysiology of diabetic nephropathy involves nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles, resulting in thickening of the basement membrane along with compromise of the filtration barrier resulting in increased permeability to solutes and proteins. Mesangial expansion of the efferent arteriole occurs, which can actually increase glomerular filtration rate (GFR). Diabetic nephropathy characteristically presents with eosinophilic nodular glomerulosclerosis, also known as Kimmelstiel-Wilson lesions, on light microscopy. The combination of increased permeability and increased GFR progresses over time in patients with diabetes mellitus, initially beginning as microalbuminuria, progressing to macroalbuminuria, and eventually to end-stage renal disease. Measurement of urine microalbumin concentration can help with the diagnosis of early diabetic nephropathy and direct management of diabetes mellitus.

Incorrect Answers: A, C, D, and E.

Serum fructosamine (Choice A) is a measurement of glycated protein in the blood, similar to the measurement of serum hemoglobin A_{1c}. It correlates with concentration of hemoglobin A_{1c} and would not add information because this patient's hemoglobin A_{1c} has already been measured.

Liver function tests (Choice C) are used in the monitoring and treatment of liver disease and are not typically measured in regard to diabetes mellitus.

Thyroid function tests (Choice D) are used in the monitoring and treatment of hypothyroidism and hyperthyroidism. While some thyroid disorders are also caused by an autoimmune process, there is no indication for routine testing of thyroid function tests in patients with diabetes mellitus.

ECG (Choice E) can be useful in the diagnosis of hypertrophic obstructive cardiomyopathy, cardiac ischemia, rate or rhythm disturbance, arrhythmia, and more, but would not be routinely indicated in the management of diabetes mellitus apart from suspicion of cardiac disease.

Educational Objective: Measurement of urine microalbumin concentration can help with the diagnosis of early diabetic nephropathy and direct management of diabetes mellitus.

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46. A 5-year-old boy is brought to the emergency department 20 minutes after being stung by a bee on his right arm at summer camp. The site immediately became red, swollen, and hot, and an itchy rash developed and quickly spread to his chest. He has not had shortness of breath, rapid breathing, wheezing, or swelling of his other extremities. On arrival, he appears slightly anxious but is not in acute distress. His temperature is 37°C (98.6°F), pulse is 98/min, respirations are 28/min, and blood pressure is 90/65 mm Hg. Examination shows moist mucous membranes. A 3-cm area of erythematous induration surrounds the site of the sting, and the right upper arm is diffusely edematous. There is an urticarial rash on the right upper arm and chest. The lungs are clear to auscultation. Which of the following measures is most likely to decrease this patient's risk for similar reactions in the future?

A) Use of permethrin spray on clothes before outdoor activity
B) Use of topical calamine lotion after a sting
C) Use of diphenhydramine before outdoor activity
D) Intravenous immune globulin therapy monthly
E) Venom immunotherapy

Correct Answer: E.

This patient has had an anaphylactic reaction to a bee sting. An anaphylactic reaction is an acute, life-threatening reaction to an allergen that leads to systemic mast cell degranulation. Anaphylactic reactions may present with hypotension caused by increased vascular permeability from histamine. A diffuse urticarial rash is common, and other organ systems may be affected such as with angioedema, bronchospasm, nausea, vomiting, or abdominal discomfort. Emergent administration of intramuscular epinephrine is necessary to prevent further consequences of anaphylaxis. To decrease the risk for severe allergic reactions in the future, immunotherapy can be performed. Immunotherapy involves the gradual exposure of increasing doses of the allergen to which a patient is allergic. This causes the immune system to become less sensitive to the allergen and decreases symptoms of the allergy when the allergen is encountered in the future.

Incorrect Answers: A, B, C, and D.

Use of permethrin spray on clothes before outdoor activity (Choice A) may help repel insects, which may decrease the chance of a bee sting, but would not decrease the severity of this patient's allergic reaction.

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D) Intravenous immune globulin therapy monthly

E) Venom immunotherapy

Correct Answer: E.

This patient has had an anaphylactic reaction to a bee sting. An anaphylactic reaction is an acute, life-threatening reaction to an allergen that leads to systemic mast cell degranulation. Anaphylactic reactions may present with hypotension caused by increased vascular permeability from histamine. A diffuse urticarial rash is common, and other organ systems may be affected such as with angioedema, bronchospasm, nausea, vomiting, or abdominal discomfort. Emergent administration of intramuscular epinephrine is necessary to prevent further consequences of anaphylaxis. To decrease the risk for severe allergic reactions in the future, immunotherapy can be performed. Immunotherapy involves the gradual exposure of increasing doses of the allergen to which a patient is allergic. This causes the immune system to become less sensitive to the allergen and decreases symptoms of the allergy when the allergen is encountered in the future.

Incorrect Answers: A, B, C, and D.

Use of permethrin spray on clothes before outdoor activity (Choice A) may help repel insects, which may decrease the chance of a bee sting, but would not decrease the severity of this patient's allergic reaction.

Use of topical calamine lotion after a sting (Choice B) can help with pain, itchiness, and discomfort, but would not affect the subsequent allergic reaction caused by mast cell degranulation.

Use of diphenhydramine (Choice C) can help with discomfort and itchiness of an urticarial reaction, but not until after urticaria develops. It is not used as a preventative measure.

Intravenous immune globulin therapy (Choice D) is used as a treatment for several autoimmune diseases, such as refractory immune thrombocytopenic purpura, Guillain-Barré syndrome, or Kawasaki disease. It has no role in the treatment or prevention of anaphylaxis.

Educational Objective: Immunotherapy involves the gradual exposure of increasing doses of the allergen to which a patient is allergic in order to decrease symptoms of the allergy when the allergen is encountered in the future.

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47. A 7-year-old girl is brought to the physician 3 days after her mother noticed a rash on her face. The patient has no other symptoms and has no history of similar skin lesions or recent trauma to the face. She feels well. Her temperature is 37°C (98.6°F). A photograph of the rash is shown. Examination shows no other abnormalities. Which of the following is the most appropriate initial treatment?

A) Topical acyclovir
B) Topical clotrimazole
C) Topical mupirocin
D) Oral acyclovir
E) Oral ketoconazole

Correct Answer: C.

Topical mupirocin is most appropriate therapy in the treatment of this patient's facial rash, which is most consistent with impetigo. Impetigo is a contagious, childhood bacterial skin infection on the face and extremities with lesions that progress from papules to vesicles and crusts that have a yellow, gold, or honey color. The most commonly responsible organisms are *Staphylococcus aureus* and Group A *Streptococcus*. The perioral area is a classic location for impetigo to develop. Impetigo is characterized as being bullous or non-bullous. In bullous impetigo, bullae are flaccid and fragile. Topical antibiotic therapy is appropriate for superficial infections such as impetigo or folliculitis. However, with widespread impetigo or in an immunocompromised host, systemic antibiotics are appropriate. Additionally, mupirocin is strongly preferred to neomycin or bacitracin, which are components of over the counter antibiotic therapy and have a high likelihood of inducing allergic contact dermatitis where applied.

Incorrect Answers: A, B, D, and E.

Topical acyclovir (Choice A) and oral acyclovir (Choice D) are treatments of viral infections. This patient's presentation and morphology is more consistent with impetigo

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Correct Answer: C.

Topical mupirocin is most appropriate therapy in the treatment of this patient's facial rash, which is most consistent with impetigo. Impetigo is a contagious, childhood bacterial skin infection on the face and extremities with lesions that progress from papules to vesicles and crusts that have a yellow, gold, or honey color. The most commonly responsible organisms are *Staphylococcus aureus* and Group A *Streptococcus*. The perioral area is a classic location for impetigo to develop. Impetigo is characterized as being bullous or non-bullous. In bullous impetigo, bullae are flaccid and fragile. Topical antibiotic therapy is appropriate for superficial infections such as impetigo or folliculitis. However, with widespread impetigo or in an immunocompromised host, systemic antibiotics are appropriate. Additionally, mupirocin is strongly preferred to neomycin or bacitracin, which are components of over the counter antibiotic therapy and have a high likelihood of inducing allergic contact dermatitis where applied.

Incorrect Answers: A, B, D, and E.

Topical acyclovir (Choice A) and oral acyclovir (Choice D) are treatments of viral infections. This patient's presentation and morphology is more consistent with impetigo rather than primary or secondary herpes simplex virus infection.

Topical clotrimazole (Choice B) is used in the treatment of superficial fungal infections such as tinea pedis, tinea corporis, or tinea unguium. There is no role for topical clotrimazole in the treatment of impetigo, which is typically caused by *S. aureus* or Group A *Streptococcus*.

Oral ketoconazole (Choice E) is a systemic antifungal medication rarely used because of liver toxicity. Systemic antifungals are commonly used in the treatment of tinea capitis, but terbinafine or griseofulvin are prescribed, not ketoconazole. For impetigo, a superficial bacterial infection, use of a systemic antifungal therapy will not be effective.

Educational Objective: Impetigo is a contagious, childhood bacterial skin infection on the face and extremities with lesions that progress from papules to vesicles and crusts that have a yellow, gold, or honey color. The most commonly responsible organisms are *Staphylococcus aureus* and Group A *Streptococcus*. Topical mupirocin is the first-line therapy for impetigo as it has adequate coverage for both of the most common pathogens.

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48. Four weeks after a flu-like illness, a 40-year-old man develops progressive dyspnea on exertion. Examination shows jugular venous distention, bilateral pulmonary crackles, a diffuse apical impulse, an apical S_3, and bilateral pedal edema. Which of the following is the most likely cause?

A) Dilated cardiomyopathy
B) Hypertrophic cardiomyopathy
C) Restrictive cardiomyopathy
D) Endocardial fibroelastosis
E) Pericardial tamponade

Correct Answer: A.

The patient's presentation is consistent with decompensated heart failure, which is characterized by dyspnea on exertion, pulmonary crackles (rales), jugular venous distension, and peripheral edema on physical examination. Further diagnostic evaluation with x-rays and echocardiography can support this diagnosis with cardiomegaly, pulmonary interstitial edema, and a decreased ejection fraction indicating abnormal systolic function. Heart failure is a clinical syndrome with a broad range of causes. The most likely cause in this case is dilated cardiomyopathy secondary to viral myocarditis. Myocarditis refers to inflammation of the cardiac myocytes; notable causes of viral myocarditis include coxsackievirus B, parvovirus B19, human herpes virus-6 (HHV-6), adenovirus, and HIV infections. Depending on the underlying pathogen, a viral prodrome may precede the development of heart failure, as in this patient who displayed symptoms of an upper respiratory infection 4 weeks before his presentation. Treatment is generally supportive as most cases remit with time. Some patients may require diuresis, and depending on severity, mechanical or pharmacologic inotropic support or transplant.

Incorrect Answers: B, C, D, and E.

Hypertrophic cardiomyopathy (Choice B) can be asymptomatic, may present with syncope on exertion, or may present with signs of heart failure as in this patient, but typically in a subacute or chronic course. Patients may also have exertional chest pain or arrhythmias. On examination, a systolic murmur can be heard because of left ventricular outflow tract obstruction. Dilated cardiomyopathy and viral myocarditis is more likely in a patient with a preceding flu-like illness.

Restrictive cardiomyopathy (Choice C) can present with signs of heart failure but is typically caused by infiltrative disease such as amyloidosis or sarcoidosis. Sarcoidosis

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Correct Answer: A.

The patient's presentation is consistent with decompensated heart failure, which is characterized by dyspnea on exertion, pulmonary crackles (rales), jugular venous distension, and peripheral edema on physical examination. Further diagnostic evaluation with x-rays and echocardiography can support this diagnosis with cardiomegaly, pulmonary interstitial edema, and a decreased ejection fraction indicating abnormal systolic function. Heart failure is a clinical syndrome with a broad range of causes. The most likely cause in this case is dilated cardiomyopathy secondary to viral myocarditis. Myocarditis refers to inflammation of the cardiac myocytes; notable causes of viral myocarditis include coxsackievirus B, parvovirus B19, human herpes virus-6 (HHV-6), adenovirus, and HIV infections. Depending on the underlying pathogen, a viral prodrome may precede the development of heart failure, as in this patient who displayed symptoms of an upper respiratory infection 4 weeks before his presentation. Treatment is generally supportive as most cases remit with time. Some patients may require diuresis, and depending on severity, mechanical or pharmacologic inotropic support or transplant.

Incorrect Answers: B, C, D, and E.

Hypertrophic cardiomyopathy (Choice B) can be asymptomatic, may present with syncope on exertion, or may present with signs of heart failure as in this patient, but typically in a subacute or chronic course. Patients may also have exertional chest pain or arrhythmias. On examination, a systolic murmur can be heard because of left ventricular outflow tract obstruction. Dilated cardiomyopathy and viral myocarditis is more likely in a patient with a preceding flu-like illness.

Restrictive cardiomyopathy (Choice C) can present with signs of heart failure but is typically caused by infiltrative disease such as amyloidosis or sarcoidosis. Sarcoidosis is a non-caseating granulomatous disease that often involves the lung, and classically presents with shortness of breath and cough. Amyloidosis is typically seen in patients with multiple myeloma and in the elderly. Sarcoidosis and amyloidosis typically have chronic or subacute presentations, not acute heart failure such as with viral myocarditis.

Endocardial fibroelastosis (Choice D) is a rare condition generally affecting children 2 years of age and younger and causes restrictive cardiomyopathy.

Pericardial tamponade (Choice E) can present with hypotension, jugular venous distension, distant heart sounds, pulsus paradoxus, and low-voltage ECG. A diffuse apical impulse and apical S3 is more consistent with dilated cardiomyopathy.

Educational Objective: Viral myocarditis can cause dilated cardiomyopathy and signs and symptoms of acute heart failure, typically with a preceding viral prodrome.

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49. A 52-year-old woman comes to the physician for a routine health maintenance examination. One year ago, she was started on daily hormone replacement therapy (estradiol and medroxyprogesterone) to treat severe vasomotor symptoms. But she has been taking the medroxyprogesterone intermittently because of severe depression and mood changes when taking it. Menses had stopped for the first 6 months on the original regimen, but since she changed her regimen, she has had vaginal spotting two to three times monthly. Which of the following is the most appropriate next step in management?

A) Discontinue medroxyprogesterone therapy only
B) Increase the dosage of estradiol
C) Add an antidepressant to the medication regimen
D) Endometrial ablation
E) Endometrial biopsy

Correct Answer: E.

Vaginal bleeding in a postmenopausal woman should raise suspicion for malignancy, including endometrial and cervical carcinoma. Endometrial carcinoma is the most common malignancy in these patients, although other causes of postmenopausal bleeding include vaginal or endometrial atrophy, polyps, and fibroids. Evaluation includes a physical examination, which may show blood in the vaginal vault. Pelvic ultrasonography may also be performed, which will show a thickened endometrial stripe in the setting of endometrial hyperplasia or carcinoma (normal is 4 mm or less in a postmenopausal woman). To confirm the diagnosis of endometrial carcinoma, an endometrial biopsy should be performed, which allows for histologic evaluation of the endometrial lining. Risk factors for the development of endometrial cancer include obesity, unopposed or prolonged estrogen exposure (eg, tamoxifen use, early menarche, late menopause, nulliparity), diabetes mellitus, and a family history of the disease. If confirmed on histology, treatment includes hysterectomy, often with bilateral salpingo-oophorectomy, followed by adjuvant chemotherapy for advanced disease. This patient demonstrates irregular postmenopausal bleeding in the setting of unopposed estrogen therapy and should undergo endometrial biopsy to assess for the presence endometrial hyperplasia or carcinoma.

Incorrect Answer: A, B, C, and D.

Discontinuing medroxyprogesterone therapy only (Choice A) is inappropriate. Unopposed estrogen therapy without concomitant progesterone therapy increases the risk

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Vaginal bleeding in a postmenopausal woman should raise suspicion for malignancy, including endometrial and cervical carcinoma. Endometrial carcinoma is the most common malignancy in these patients, although other causes of postmenopausal bleeding include vaginal or endometrial atrophy, polyps, and fibroids. Evaluation includes a physical examination, which may show blood in the vaginal vault. Pelvic ultrasonography may also be performed, which will show a thickened endometrial stripe in the setting of endometrial hyperplasia or carcinoma (normal is 4 mm or less in a postmenopausal woman). To confirm the diagnosis of endometrial carcinoma, an endometrial biopsy should be performed, which allows for histologic evaluation of the endometrial lining. Risk factors for the development of endometrial cancer include obesity, unopposed or prolonged estrogen exposure (eg, tamoxifen use, early menarche, late menopause, nulliparity), diabetes mellitus, and a family history of the disease. If confirmed on histology, treatment includes hysterectomy, often with bilateral salpingo-oophorectomy, followed by adjuvant chemotherapy for advanced disease. This patient demonstrates irregular postmenopausal bleeding in the setting of unopposed estrogen therapy and should undergo endometrial biopsy to assess for the presence endometrial hyperplasia or carcinoma.

Incorrect Answer: A, B, C, and D.

Discontinuing medroxyprogesterone therapy only (Choice A) is inappropriate. Unopposed estrogen therapy without concomitant progesterone therapy increases the risk for endometrial cancer. In this patient with concern for endometrial hyperplasia or carcinoma, discontinuing the concurrent progesterone therapy would be contraindicated.

Increasing the dosage of estradiol (Choice B) is inappropriate. Estrogen therapy, particularly when unopposed by concurrent progesterone therapy, greatly increases the risk for endometrial hyperplasia and carcinoma. Increasing the estradiol dosage would be contraindicated in this patient.

Adding an antidepressant to the medication regimen (Choice C) is not warranted at this time. This patient has postmenopausal bleeding in the setting of unopposed estrogen therapy, raising concern for endometrial hyperplasia or carcinoma. She should undergo endometrial biopsy for further evaluation.

Endometrial ablation (Choice D) is not recommended in patients at risk for endometrial cancer. Ablation of the endometrial cavity may make the diagnosis more difficult by obscuring the symptoms of endometrial cancer and/or by interfering with adequate tissue sampling and histologic evaluation. Endometrial biopsy should be performed rather than endometrial ablation.

Educational Objective: Postmenopausal vaginal bleeding should raise suspicion for endometrial carcinoma, particularly in patients that have risk factors for it, such as obesity, family history, unopposed or prolonged estrogen exposure, and diabetes mellitus. Evaluation includes endometrial sampling, particularly when the endometrial lining is greater than 4 mm in thickness on ultrasonography. Treatment includes hysterectomy and adjuvant chemotherapy for advanced disease.

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50. A 77-year-old man is brought to the physician by his family because of a 10-week history of decreased appetite that has resulted in a 10.4-kg (23-lb) weight loss. During this time, he also has had a persistent, nonproductive cough, intermittent nausea, and constipation. He reports that he has been sleeping 10 hours daily but does not feel rested. His family states that he had an upper respiratory tract infection prior to the weight loss and that he never "bounced back" from the infection. He had smoked one to two packs of cigarettes daily for 60 years but has recently cut back to one to two cigarettes daily because he no longer enjoys the taste. He appears tired and cachectic. He is 175 cm (5 ft 9 in) tall and weighs 58 kg (129 lb); BMI is 19 kg/m^2. His temperature is 36°C (96.8°F), pulse is 86/min, and blood pressure is 120/78 mm Hg. The lungs are clear to auscultation. Abdominal examination shows no tenderness and mild distention. There is trace pedal edema. On mental status examination, he has a sad mood and constricted affect. His speech is slow. He is oriented to person, place, and time. He cannot perform serial sevens. An x-ray of the chest shows no abnormalities. An x-ray of the abdomen shows copious stool. Which of the following is the most appropriate next step in management?

A) Assessment for suicide risk
B) Neuropsychological testing
C) Bronchoscopy
D) Polysomnography
E) Placement of a feeding tube

Correct Answer: A.

Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating (as evidenced by this patient inability to perform serial sevens), psychomotor retardation or agitation (as evidenced by this patient's slow speech), suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt social or occupational functioning. The presence of somatic symptoms such as gastrointestinal distress and chronic cough are also commonly seen in conjunction with depression, especially in older patients. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation. If a patient endorses active suicidal ideation, then inpatient psychiatric hospitalization should be strongly considered. Suicide is one of the most significant potential consequences of MDD and should be actively addressed. The typical initial treatment of MDD includes both psychotherapy and antidepressant medication, though in older patients with significant weight loss, electroconvulsive therapy should be considered to promote rapid improvement.

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Correct Answer: A.

Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating (as evidenced by this patient inability to perform serial sevens), psychomotor retardation or agitation (as evidenced by this patient's slow speech), suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt social or occupational functioning. The presence of somatic symptoms such as gastrointestinal distress and chronic cough are also commonly seen in conjunction with depression, especially in older patients. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation. If a patient endorses active suicidal ideation, then inpatient psychiatric hospitalization should be strongly considered. Suicide is one of the most significant potential consequences of MDD and should be actively addressed. The typical initial treatment of MDD includes both psychotherapy and antidepressant medication, though in older patients with significant weight loss, electroconvulsive therapy should be considered to promote rapid improvement.

Incorrect Answers: B, C, D, and E.

Neuropsychological testing (Choice B) is commonly utilized to clarify the cause of a patient's cognitive impairment. However, this patient's inattention is likely secondary to MDD given the presence of several other depressive symptoms.

Bronchoscopy (Choice C) is utilized to biopsy lung tissue to obtain a tissue diagnosis in patients with lesions shown on imaging. This patient did not have lesions on x-ray of the chest.

Polysomnography (Choice D) is commonly utilized to clarify the cause of a patient's insomnia. However, this patient's insomnia is likely secondary to MDD given the presence of several other depressive symptoms.

Placement of a feeding tube (Choice E) is an invasive measure that should only be considered in emergency situations in which death would occur imminently. This patient's BMI is not yet critical. His depression should instead be actively treated, which would likely improve his appetite and BMI.

Educational Objective: Symptoms of MDD include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or worthlessness, difficulty concentrating, suicidal thoughts, and neurovegetative symptoms. In many patients, physical symptoms are predominant. In patients with suspected or confirmed MDD, physicians should promptly screen for suicidal ideation.

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1. A 57-year-old man comes to the physician because of a 1-year history of low back pain that radiates to the buttocks when he walks. He has not had leg pain or pain at rest. The pain is relieved within 1 minute when he stops walking. He has a 1-year history of erectile dysfunction. He has smoked one pack of cigarettes daily for 30 years. His pulse is 85/min, and blood pressure is 160/100 mm Hg. Flexion of either hip with the knee extended does not cause pain. Pedal pulses are decreased. Sensation is intact. His hematocrit is 40%, erythrocyte sedimentation rate is 20 mm/h, and serum glucose concentration is 180 mg/dL. Which of the following is the most likely diagnosis?

A) Aortoiliac occlusion
B) Dissecting aortic aneurysm
C) Herniated nucleus pulposus
D) Lumbar discitis
E) Pyelonephritis
F) Spinal stenosis

Correct Answer: A.

Aortoiliac occlusion, also known as iliac occlusive disease (Leriche syndrome), is a specific subtype of peripheral arterial disease (PAD) that presents with claudication, erectile dysfunction, and decreased lower extremity arterial pulses. Claudication refers to muscular pain that develops with exercise and improves with rest caused by the impaired ability of the narrowed arteries to provide adequate blood flow to muscles during exercise. PAD can progress to cause chronic extremity ischemia, rest pain, ulceration, and gangrene. Diagnosis is typically made by evaluation of ankle brachial systolic pressure indices, with a score of less than 0.90 being indicative of PAD, or vascular imaging. Risk factors for development include obesity, hypertension, hyperlipidemia, tobacco use, diabetes mellitus, male sex, older age, and concomitant arterial disease elsewhere. Treatment is supportive, although severe occlusive disease may be treated with surgical revascularization. This patient presents with low back and buttock claudication, erectile dysfunction, and diminished peripheral pulses, making aortoiliac occlusion the most likely diagnosis.

Incorrect Answers: B, C, D, E, and F.

Dissecting aortic aneurysm (Choice B) commonly presents with the acute onset of chest or abdominal pain that radiates to the back associated with a blood pressure differential in the extremities. Other symptoms and complications are dependent on the extent and location of dissection and can include stroke, end-stage kidney disease, mesenteric ischemia, heart murmur or bruit, hypotension, and syncope. X-rays may show a widened mediastinum. Dissecting aortic aneurysms are surgical emergencies associated with high morbidity and mortality and would not likely cause ongoing lower extremity symptoms for more than a year.

Herniated nucleus pulposus (Choice C) can cause radicular back pain as a result of nerve root compression. It is commonly associated with acute onset back pain that radiates down the leg, often after some degree of straining while lifting or bending. On physical examination, a straight leg raise will reproduce the symptoms. This patient's straight leg raise was normal, making a herniated nucleus pulposus unlikely.

Lumbar discitis (Choice D) is an infection or inflammation of an intervertebral disc in the lumbar region. It would be expected to present with fever, localized back pain without radiation, limited range of motion as a result of pain, leukocytosis, and increased inflammatory markers.

Pyelonephritis (Choice E) is an infection of the kidney, most commonly secondary to an ascending urinary tract infection. It presents with fever, dysuria, hematuria, urinary frequency and urgency, and flank pain. It can also cause sepsis with associated hypotension and shock. This patient has no signs or symptoms of infection.

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D) Lumbar discitis

E) Pyelonephritis

F) Spinal stenosis

Correct Answer: A.

Aortoiliac occlusion, also known as iliac occlusive disease (Leriche syndrome), is a specific subtype of peripheral arterial disease (PAD) that presents with claudication, erectile dysfunction, and decreased lower extremity arterial pulses. Claudication refers to muscular pain that develops with exercise and improves with rest caused by the impaired ability of the narrowed arteries to provide adequate blood flow to muscles during exercise. PAD can progress to cause chronic extremity ischemia, rest pain, ulceration, and gangrene. Diagnosis is typically made by evaluation of ankle brachial systolic pressure indices, with a score of less than 0.90 being indicative of PAD, or vascular imaging. Risk factors for development include obesity, hypertension, hyperlipidemia, tobacco use, diabetes mellitus, male sex, older age, and concomitant arterial disease elsewhere. Treatment is supportive, although severe occlusive disease may be treated with surgical revascularization. This patient presents with low back and buttock claudication, erectile dysfunction, and diminished peripheral pulses, making aortoiliac occlusion the most likely diagnosis.

Incorrect Answers: B, C, D, E, and F.

Dissecting aortic aneurysm (Choice B) commonly presents with the acute onset of chest or abdominal pain that radiates to the back associated with a blood pressure differential in the extremities. Other symptoms and complications are dependent on the extent and location of dissection and can include stroke, end-stage kidney disease, mesenteric ischemia, heart murmur or bruit, hypotension, and syncope. X-rays may show a widened mediastinum. Dissecting aortic aneurysms are surgical emergencies associated with high morbidity and mortality and would not likely cause ongoing lower extremity symptoms for more than a year.

Herniated nucleus pulposus (Choice C) can cause radicular back pain as a result of nerve root compression. It is commonly associated with acute onset back pain that radiates down the leg, often after some degree of straining while lifting or bending. On physical examination, a straight leg raise will reproduce the symptoms. This patient's straight leg raise was normal, making a herniated nucleus pulposus unlikely.

Lumbar discitis (Choice D) is an infection or inflammation of an intervertebral disc in the lumbar region. It would be expected to present with fever, localized back pain without radiation, limited range of motion as a result of pain, leukocytosis, and increased inflammatory markers.

Pyelonephritis (Choice E) is an infection of the kidney, most commonly secondary to an ascending urinary tract infection. It presents with fever, dysuria, hematuria, urinary frequency and urgency, and flank pain. It can also cause sepsis with associated hypotension and shock. This patient has no signs or symptoms of infection.

Spinal stenosis (Choice F) presents with neurogenic, rather than vascular, claudication. This claudication, or pain, worsens with exercise, standing, or certain positions but is relieved by a change in position to sitting or lying. The pain does not improve solely with rest.

Educational Objective: Aortoiliac occlusion, also known as iliac occlusive disease (Leriche syndrome), is a specific peripheral arterial disease that presents with low back and buttocks claudication, erectile dysfunction, and decreased or absent lower extremity arterial pulses. Vascular claudication refers to muscular pain that occurs with exercise and improves with rest caused by the inability of the narrowed vessels to provide adequate blood flow to the exercising muscles. Risk factors for development include obesity, hypertension, hyperlipidemia, tobacco use, diabetes mellitus, male sex, older age, and concomitant arterial disease elsewhere.

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2. A 60-year-old female store clerk comes to the office for an annual health maintenance examination. Her medical history is unremarkable except for gastroesophageal reflux disease, for which she takes ranitidine at bedtime with good relief. Her last menstrual period was 6 years ago. Mammogram 5 years ago and Pap smear 2 years ago were normal. She does not exercise regularly. She eats a regular diet. She has smoked one pack of cigarettes daily for 40 years and drinks one to two glasses of wine weekly. Her family history is significant only for diet-controlled diabetes mellitus in her mother. The patient is 157 cm (5 ft 2 in) tall and weighs 68 kg (150 lb); BMI is 27 kg/m^2. Her waist-to-hip ratio is 1.05. Cardiopulmonary, abdominal, and genitourinary examinations are normal for her age and sex assigned at birth. This patient's greatest risk of mortality at this time is from which of the following?

A) Breast cancer
B) Cardiovascular disease
C) Cervical cancer
D) Hip fracture
E) Lung cancer

Correct Answer: B.

Cardiovascular disease is the leading cause of mortality in the United States and the risk significantly increases for women following the menopausal transition. Female hormones have cardioprotective associations, and the changes in sex hormones that occur with menopause reduce this protection. In the absence of other significant medical comorbidities or specific risk factors, this patient's greatest risk of mortality is from cardiovascular disease. Other factors that contribute to increased cardiovascular disease risk include smoking, sedentary lifestyle, hypertension, obesity, hypercholesterolemia, age, and family history of cardiovascular disease. In addition to routine screening, this patient would benefit from smoking cessation, healthy diet and regular exercise, and monitoring of blood pressure, hemoglobin A_{1c}, and lipid concentrations.

Incorrect Answers: A, C, D, and E.

Breast cancer (Choice A) is a common cause of morbidity and mortality in women. Breast cancer risk is associated with endogenous estrogen concentrations, which decrease in postmenopausal women compared to premenopausal women with similar background characteristics. Exposure to exogenous hormone therapy increases breast cancer risk in postmenopausal women.

Cervical cancer (Choice C) is more common in women who have human papillomavirus (HPV) infection, particularly the strains HPV-16 and HPV-18. A history of multiple sexual partners, tobacco use, or immunosuppression also places patients at increased risk.

Hip fracture (Choice D) risk increases as patients age and does increase significantly in postmenopausal women, as decreased estrogen concentrations increase the rate of bone resorption over bone formation. This leads to decreased bone mineral density (osteopenia and osteoporosis), which increases the risk for hip fracture. Hip fracture is associated with increased mortality in patients over age 60 years, though cardiovascular disease comprises a significantly higher burden.

Lung cancer (Choice E) is one of the top causes of mortality behind cardiovascular disease worldwide. Some studies have shown an association between hormone therapy for menopause and an increased risk for developing lung cancer.

Educational Objective: Cardiovascular disease is the leading cause of mortality in the United States, and the risk significantly increases for postmenopausal women as a result of the loss of cardioprotective benefits from estrogens. Modifiable risk factors include diet, activity levels, management of comorbidities, and smoking cessation.

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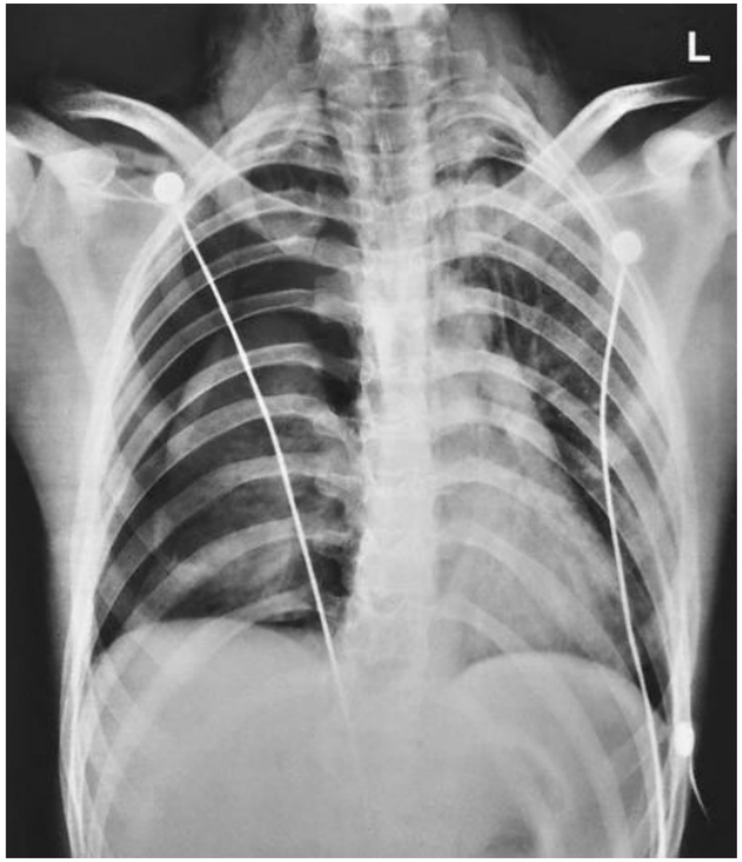

3. A 36-year-old man is brought to the emergency department after he developed chest pain and dyspnea while attempting a 10K run. He has had mild asthma for several years but he takes no medications for it. He says that he has developed a nonproductive cough recently. He has not had fever, but he has noticed a decrease in his appetite and a 2.5-kg (5-lb) weight loss during the past 6 weeks. Vital signs are pulse 100/min, respirations 26/min, and blood pressure 100/72 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. Breath sounds are diminished on the right and there is increased resonance on percussion. Chest x-ray is shown. Which of the following is the most appropriate treatment at this time?

A) Endotracheal intubation
B) Nebulized albuterol
C) Observation and administration of nasal oxygen
D) Thoracotomy

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A) Endotracheal intubation
B) Nebulized albuterol
C) Observation and administration of nasal oxygen
D) Thoracotomy
E) Tube thoracostomy

Correct Answer: E.

Pneumothorax results from air entering the intrapleural space from either an external (eg, stab wound) or internal (eg, ruptured bleb or bronchus, bronchopleural fistula) source. As air accumulates within the space, the lung parenchyma becomes compressed, resulting in reduced breath sounds and respiratory distress. In severe cases, mediastinal structures may be stretched or compressed, compromising venous return, resulting in obstructive shock (known as a tension pneumothorax). On physical examination, a pneumothorax presents as unilateral diminished breath sounds with hyperresonance to percussion. Pneumothorax can appear on chest x-ray as radiolucent air and the absence of interstitial lung markings in the pleural space adjacent to the lung parenchyma. If a pneumothorax is large, tube thoracostomy should be performed to evacuate the air in the pleural space to aid in lung re-expansion. Once a chest tube is placed and healing of the inciting injury occurs, leakage of air into the pleural space should stop. If a persistent air leak is noted, the source of the leak should be investigated. A ruptured bronchus requires extended time to heal and is a potential source of air leak. If the leak persists, surgical correction of the rupture may be required to prevent chronic pneumothorax from a resultant bronchopleural fistula.

Incorrect Answers: A, B, C, and D.

Endotracheal intubation (Choice A) is indicated in patients who are apneic, hypoxic, or hypercapnic; not responding to less invasive means; or are unable to protect their airway (eg, lethargic, no gag or cough reflex). However, in patients with pneumothorax, intubation can worsen intrapleural air and lead to tension pneumothorax. If a pneumothorax is known, tube thoracostomy should be performed prior to intubation if the patient requires intubation.

Nebulized albuterol (Choice B) would be indicated to treat asthma or chronic obstructive pulmonary disease exacerbation. In either exacerbation, diffuse expiratory wheezes would be heard on auscultation. This patient's clinical presentation and x-ray are more suggestive of a pneumothorax.

Observation and administration of nasal oxygen (Choice C) can be trialed in patients with small or moderate pneumothoraces, which can sometimes self-resolve. Large pneumothoraces are unlikely to self-resolve and usually require tube thoracostomy. Generally, oxygen is supplied via a nonrebreather mask to promote lung healing and blood flow regardless of oxygen saturation, not via nasal cannula.

Thoracotomy (Choice D) is an invasive procedure that allows for control of thoracic hemorrhage, decompression of cardiac tamponade, or management of aortic or pulmonary hemorrhage. Thoracotomy may be indicated in cases of penetrating trauma with hemodynamic instability or in cases of cardiac arrest of less than 15 minutes duration with witnessed loss of signs of life. This patient is hemodynamically stable and should be managed by tube thoracostomy, not thoracotomy.

Educational Objective: Pneumothorax results from air entering the intrapleural space from either an external (eg, stab wound) or internal (eg, ruptured bleb or bronchus, bronchopleural fistula) source. Tube thoracostomy should be performed in large pneumothoraces to evacuate the air in the pleural space to aid in lung re-expansion.

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4. A 15-year-old girl is brought to the emergency department by her mother because of a 2-week history of heavy vaginal bleeding. Menarche was at the age of 14 years. Menses occur at irregular 21- to 35-day intervals and last 10 days with moderate flow. She has never been sexually active. She is not in distress. She is at the 55th percentile for height, 70th percentile for weight, and 60th percentile for BMI. Her temperature is 38°C (100.4°F), and blood pressure is 90/55 mm Hg. Examination shows pallor. Laboratory studies show a hemoglobin concentration of 9 g/dL, leukocyte count of 5500/mm^3, and platelet count of 15,000/mm^3. Which of the following is the most likely diagnosis?

A) Cervical ectropion
B) Endometrial polyp
C) Immune thrombocytopenic purpura
D) Submucous myoma
E) Thrombotic thrombocytopenic purpura

Correct Answer: C.

Immune thrombocytopenic purpura (ITP) occurs secondary to an autoimmune process leading to the destruction of circulating platelets followed by the subsequent development of thrombocytopenia. Signs and symptoms include petechiae, purpura, mucosal bleeding, menorrhagia, and prolonged bleeding from minor injuries. The underlying cause is incompletely understood but involves formation of antiplatelet IgG antibodies with subsequent platelet opsonization and phagocytosis by splenic macrophages. The diagnosis is one of exclusion after other potential causes of thrombocytopenia, such as viral infection, hematologic malignancy, and adverse effects of medication have been ruled out. Bone marrow biopsy will most likely show an increased number of megakaryocytes indicating adequate platelet production but increased peripheral destruction of platelets. Platelets appear normal on peripheral blood smear. Coagulation studies are also normal, although bleeding time is prolonged. ITP often occurs following an infection, frequently with *Helicobacter pylori*, Epstein-Barr virus, or HIV, and is generally self-limited. Chronic ITP is first treated with steroids, intravenous immunoglobulin, or immunomodulatory drugs. Refractory ITP is treated with splenectomy, which results in remission of thrombocytopenia in most cases.

Incorrect Answers: A, B, D, and E.

Cervical ectropion (Choice A) occurs when there is slight eversion of the cervix, exposing a portion of the endocervix and its columnar mucosa to the vaginal canal. In young women, it is a normal variant and does not warrant treatment, although it does increase the risk for acquiring sexually transmitted infections such as *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and HIV. While it may lead to abnormal vaginal bleeding, it does not manifest with thrombocytopenia.

Endometrial polyps (Choice B) may cause uterine bleeding that is irregular, unpredictable, or not associated with usual menstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). It does not cause thrombocytopenia.

Submucous myoma (Choice D), also known as leiomyomata uteri or uterine fibroids, are benign neoplasms of the uterine myometrium. They are a potential cause of abnormal uterine bleeding and pelvic pain, but do not cause thrombocytopenia.

Thrombotic thrombocytopenic purpura (Choice E) presents with fever, microangiopathic hemolytic anemia, thrombocytopenia, renal dysfunction, and neurologic abnormalities, although not all these features may be present. This patient lacks all these features with the exception of thrombocytopenia.

Educational Objective: ITP results from the immune-mediated destruction of circulating platelets. It presents with thrombocytopenia, mucosal bleeding, and petechiae or purpura from cutaneous hemorrhage.

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Educational Objective: ITP results from the immune-mediated destruction of circulating platelets. It presents with thrombocytopenia, mucosal bleeding, and petechiae or purpura from cutaneous hemorrhage. Platelets appear normal on peripheral blood smear. Coagulation studies are normal, although bleeding time will be prolonged. Treatment includes steroids, intravenous immunoglobulin, or splenectomy, if refractory.

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5. A 49-year-old man comes to the office because of a 2-week history of dark urine. He has had a 5-kg (11-lb) weight loss during the past month despite no change in appetite. He has no history of serious illness and takes no medications. His temperature is 37.5°C (99.5°F), pulse is 80/min, respirations are 12/min, and blood pressure is 132/86 mm Hg. Examination shows conjunctival icterus. A 5-cm, nontender mass is palpated in the right upper quadrant of the abdomen. Serum studies show a total bilirubin concentration of 6 mg/dL, with a direct component of 5.2 mg/dL, and a lactate dehydrogenase activity of 480 U/L. Abdominal ultrasonography shows an enlarged gallbladder with no calculi, a 2-cm-wide common bile duct with no calculi that tapers at the distal end, and a 5-cm mass in the head of the pancreas. A CT scan of the abdomen shows a 5-cm mass in the head of the pancreas compressing the superior mesenteric vein and partially encasing the superior mesenteric artery. Results of a fine-needle biopsy show hyperchromatic, pleomorphic cells with a high nucleus-to-cytoplasm ratio. Further diagnostic studies show no evidence of metastatic disease. Which of the following factors is most predictive of a poor prognosis in this patient?

A) Bilirubin concentration
B) Patient's age
C) Patient's sex assigned at birth
D) Tumor encasement of the superior mesenteric vessels
E) Tumor location in the head of the pancreas rather than the tail

Correct Answer: D.

Pancreatic cancer is associated with a high mortality rate, as it commonly presents after becoming locally invasive or metastatic. It classically presents with fatigue, unexplained weight loss, and painless jaundice. Physical examination may disclose hepatomegaly, cachexia, and a right upper quadrant or epigastric mass on palpation of the abdomen (distended, nontender gallbladder). Results of laboratory studies frequently show conjugated hyperbilirubinemia, indicative of cholestasis secondary to compression by a pancreatic head carcinoma, as seen in this patient. For tumors arising in the body or tail of the pancreas, migratory superficial thrombophlebitis, as well as arterial and venous emboli, can occur. Occasionally, pancreatic cancer is discovered as an incidental finding on an imaging study used in the evaluation of another pathology. Risk factors for its development include smoking, obesity, and a family history or genetic predisposition, among others. Treatment with surgical resection is the best curative option. A mass isolated to the pancreas is more likely to be resectable and thus associated with an improved prognosis. One contraindication to surgical resection is the encasement of the superior mesenteric artery, which is seen in this patient. As such, this patient cannot undergo surgical resection of the tumor and has increased mortality given local advancement and involvement of vital major vessels.

Incorrect Answers: A, B, C, and E.

Bilirubin concentration (Choice A) is not directly related to pancreatic cancer prognosis. Increased bilirubin concentration is caused by compression of the common bile duct by the tumor, causing conjugated hyperbilirubinemia. The bilirubin concentration is dependent on mass size and the level of compression, but it gives no information about the local spread of disease.

Patient's age (Choice B) by itself does not put him at increased risk of mortality as a result of his pancreatic cancer. He is relatively young and would likely tolerate a major operation required to surgically resect the mass if it was not contraindicated. If he were elderly, his age may worsen his prognosis, but to a lesser degree than the local spread of his cancer.

Patient's sex assigned at birth (Choice C) is not associated with a worse prognosis. The factor most associated with prognosis is the cancer stage, with metastases to distant locations conferring the worst prognosis. Local invasion of the tumor, especially when it prevents surgical resection, is associated with worsened prognosis.

Tumor location in the head of the pancreas rather than the tail (Choice E) is associated with improved prognosis. This is most commonly a result of pancreatic body and tail tumors presenting at a later stage, often after they have already metastasized

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Tumor location in the head of the pancreas rather than the tail (Choice E) is associated with improved prognosis. This is most commonly a result of pancreatic body and tail tumors presenting at a later stage, often after they have already metastasized.

Educational Objective: Pancreatic cancer is associated with significant morbidity and mortality, as it often presents at an advanced stage. The most common presentation is fatigue, unexplained weight loss, and painless jaundice. The curative treatment is surgical resection, with contraindications including metastases and vascular encasement. The inability to surgically resect pancreatic cancer is associated with a poor prognosis.

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6. A 60-year-old man comes to the emergency department 6 hours after the onset of shortness of breath associated with a nonproductive cough. One year ago, he was diagnosed with mild hypertension. His pulse is 100/min, respirations are 26/min, and blood pressure is 140/105 mm Hg. Ophthalmoscopic examination shows arteriolar narrowing but no papilledema. There is no peripheral edema. An S_3, S_4, and crackles at the bases of both lungs are heard, and jugular veins are distended. Which of the following is the most likely diagnosis?

A) Cardiac amyloidosis
B) Chronic aortic dissection
C) Congestive heart failure
D) Constrictive pericarditis
E) Renal artery stenosis

Correct Answer: C.

This patient's history, signs, symptoms, and examination findings are consistent with acute congestive heart failure. On physical examination, there is an S_4 gallop suggestive of a stiff and noncompliant left ventricle and an S_3 suggestive of reduced emptying of the ventricular chambers. Jugular venous distension and pulmonary crackles are suggestive of impaired forward flow of blood. Retinal arteriolar narrowing is associated with chronic hypertension. Hypertension is a common cause of congestive heart failure and is considered a modifiable risk factor. Chronic hypertension may result in left ventricular hypertrophy as a result of constant work against an increased afterload. The thickened myocardium results in impaired left ventricular relaxation and increased diastolic filling pressures that lead to left atrial enlargement and right-sided heart failure over time.

Incorrect Answers: A, B, D, and E.

Cardiac amyloidosis (Choice A) is an infiltrative cardiomyopathy caused by the deposition of amyloid protein throughout the extracellular space of the heart. Advanced disease results in restrictive cardiomyopathy and development of heart failure. It is less common than congestive heart failure caused by chronic hypertension and ischemic heart disease.

Chronic aortic dissection (Choice B) refers to dissection that has been present for greater than 90 days and has undergone vascular remodeling. Complications include acute rupture, which presents with tearing pain radiating to the back, and malperfusion, with symptoms dependent on the affected vascular beds. This patient's physical examination findings are not consistent with chronic aortic dissection.

Constrictive pericarditis (Choice D) typically presents with sharp chest pain that is aggravated by inspiration and alleviated by sitting and leaning forward. A coarse, sandpaper-like friction rub may be heard on cardiac auscultation. Physical examination findings also include fever, hypotension, tachycardia, pulsus paradoxus, and the Kussmaul sign (an increase in jugular venous distension during inspiration).

Renal artery stenosis (Choice E) is a cause of secondary hypertension as a result of excessive production of renin and angiotensin. It can result from atherosclerosis in older patients and may be a cause of acute congestive heart failure. Hypertension in renal artery stenosis tends to be resistant to treatment, and multiple antihypertensive agents are needed.

Educational Objective: Congestive heart failure is a commonly encountered clinical syndrome associated with chronic hypertension and coronary artery disease. Physical examination findings can include elevated jugular venous pressure, peripheral edema, ascites, hepatojugular reflux, pulmonary crackles, and an S_3 or S_4 gallop.

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✓ 7. Immediately after delivery to a 17-year-old primigravid patient, a 500-g (1-lb 2-oz) male newborn fails to breathe spontaneously and has a pulse of 30/min. The mother had no prenatal care and says that her last menstrual period was 2 or 3 months ago. Examination of the newborn shows edematous hands and feet and dark red skin without lanugo. The eyelids are fused. He is hypotonic. All four extremities are in extension. The nipples are barely visible, and the testes are undescended. After several minutes of bag-valve-mask ventilation with 100% oxygen and chest compressions, the pulse falls below 30/min, and there are still no spontaneous respirations. Which of the following is the most appropriate next step in management?

A) Continued bag-valve-mask ventilation and chest compressions until the pulse is absent
B) Administration of surfactant
C) Endotracheal intubation and continued bag-valve ventilation with 100% oxygen
D) Placement of an umbilical venous catheter for infusion of epinephrine
E) Discontinuation of resuscitative efforts

Correct Answer: E.

This newborn patient has undergone premature delivery, likely during the first or early second trimester of pregnancy, as evidenced by the newborn's size, incompletely developed eyes, nipples, and extremities, and lack of lanugo (body hair that typically develops in the 4th or 5th month of gestation). Premature delivery in early pregnancy results in stillbirth caused by incomplete development of the neonatal lungs and brain, which do not complete their maturation until the end of the second trimester. The diagnosis of death in newborns requires a careful examination, which may be complicated by the fact that many reflexes are not fully developed, and ocular examination (as well as examination of corneal, vestibular, and oculocephalic reflexes) may be impossible. Apnea testing is a reliable method for diagnosing death and involves providing adequate oxygenation via ventilator, followed by observation of a rise in carbon dioxide levels caused by lack of spontaneous respirations as the ventilator is weaned. EEG is not usually necessary, but, if performed, demonstrates electrocerebral silence, or lack of electrical waveforms. In the setting of death in a nonviable, premature newborn, it is appropriate to discontinue resuscitative efforts. Generally, any fetus of less than gestational age 22 to 23 weeks (depending on the particular center caring for the child) will be nonviable, and resuscitation efforts would be inappropriate.

Incorrect Answers: A, B, C, and D.

Continued bag-valve-mask ventilation and chest compressions until the pulse is absent (Choice A) is incorrect. This newborn demonstrates a lack of spontaneous respirations as a result of prematurity and incomplete lung and brainstem development. Maintaining ventilation is not possible within this setting, and it is not necessary to continue ventilation and chest compressions until the pulse is absent.

Administration of surfactant (Choice B) is unlikely to be successful. Apnea in this setting is caused not only by incomplete lung maturation, but also incomplete brainstem development. Endotracheal intubation and continued bag-valve ventilation with 100% oxygen (Choice C) is unlikely to be successful for similar reasons.

Placement of an umbilical venous catheter for infusion of epinephrine (Choice D) is incorrect. Umbilical venous catheters can be useful for obtaining vascular access in newborns. However, it is inappropriate to administer epinephrine as part of continued resuscitative efforts given that this newborn demonstrates clear evidence of death.

Educational Objective: Diagnosing death in newborns requires a careful examination of cranial reflexes, apnea, lack of responsiveness, and may be supported by EEG. In the setting of death in a nonviable, premature newborn, it is appropriate to discontinue resuscitative efforts.

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8. Fifteen days after sustaining third-degree burns of the abdomen and lower extremities, a hospitalized 67-year-old man has fever. He is intubated and mechanically ventilated. He is receiving cefazolin, lorazepam, and atenolol. His temperature is 38.9°C (102°F), pulse is 90/min, and blood pressure is 110/70 mm Hg. A small amount of cloudy fluid is draining around the nasogastric tube. The burn wounds are clean. The lungs are clear to auscultation. The abdomen is soft. Rectal examination shows no abnormalities. Femoral pulses are intact. Laboratory studies show a hematocrit of 35% and leukocyte count of 15,000/mm^3. A chest x-ray shows no abnormalities; endotracheal and nasogastric tubes are in proper position. Which of the following is the most appropriate next step in diagnosis?

A) CT angiography of the chest
B) CT scan of the abdomen and pelvis
C) CT scan of the sinuses
D) MRI of the anorectal region
E) MRI of the brain

Correct Answer: C.

Acute, nosocomial sinusitis can develop in patients in the intensive care unit. Both endotracheal tubes and nasogastric tubes can decrease sinus drainage, promoting the accumulation of secretions and growth/introduction of bacterial pathogens. Bacterial sinusitis commonly presents with fever and purulent nasal drainage, as well as cough and headache. CT scan of the sinuses is used to make the diagnosis in critically ill patients, with opacified sinuses indicative of sinusitis. Management includes antibiotic therapy targeted toward the causative organism based on sinus fluid cultures, as well as removing endotracheal and nasogastric tubes, if possible, to allow drainage. Operative sinus drainage may be necessary. This patient has a fever, leukocytosis, and purulent nasal drainage in the setting of an endotracheal and nasogastric tube with no other signs of infection. He should therefore undergo a CT scan of the sinuses.

Incorrect Answers: A, B, D, and E.

CT angiography of the chest (Choice A) is used to evaluate for pulmonary emboli or vascular malformations in the chest. While pulmonary emboli can cause fever, they commonly cause tachycardia, hypoxia, and pleuritic chest pain. Based on physical examination, the more likely cause of fever in this patient is acute nosocomial sinusitis.

CT scan of the abdomen and pelvis (Choice B) can be used to evaluate for intra-abdominal sources of infection, such as abscesses, pyelonephritis, or cholecystitis. This patient has symptoms of a systemic infection with fever and leukocytosis but has had no intra-abdominal interventions and no other signs of intra-abdominal infection, such as tenderness to palpation or hematuria. Therefore, with the presence of purulent nasal discharge, acute sinusitis is a more likely cause of his fever.

MRI of the anorectal region (Choice D) can be used to evaluate the soft tissues of the anus and rectum. It can be used in the evaluation of anal or rectal cancer, fistulas, pilonidal lesions, and anal fissures. This patient has no abnormalities on rectal examination and is unlikely to have developed a cutaneous fistula or pilonidal lesion during his hospital stay, making an MRI of the anorectal region inappropriate.

MRI of the brain (Choice E) is commonly used in the evaluation of neurologic malignancies, ischemic and hemorrhagic strokes, and congenital malformations, although it can also be used to evaluate for intracerebral infections, such as brain abscesses. This patient has no focal neurologic deficits to suggest an intracranial lesion. Given his nasogastric tube placement and purulent nasal discharge, acute sinusitis is a more likely cause of his fever.

Educational Objectives: Both endotracheal tubes and nasogastric tubes can cause acute sinusitis in critically ill patients as a result of impaired sinus drainage. Symptoms include fever, cough, headache, and purulent nasal drainage. Diagnosis is made with CT scan of the sinuses, which will show opacification of the sinuses, and culture of the sinus fluid. Management is with antibiotic therapy and removal of the obstruction, although operative sinus drainage may also be required.

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9. A 13-month-old boy is brought to the physician for a follow-up examination. He completed a 10-day course of amoxicillin for an episode of pneumonia 10 days ago. He has had four episodes of pneumonia since birth and had severe chickenpox at the age of 8 months. He is below the 5th percentile for length and weight. His temperature is 37.4°C (99.3°F), pulse is 120/min, respirations are 30/min, and blood pressure is 94/50 mm Hg. Examination shows no abnormalities except for oral thrush. Laboratory studies show a leukocyte count of 1500/mm^3 (50% segmented neutrophils, 8% eosinophils, 1% basophils, 35% lymphocytes, and 6% monocytes), a CD4+ T-lymphocyte count of 225/mm^3 (Normal≥500), and a low lymphocyte proliferative response. Which of the following is the most likely diagnosis?

A) Combined immunodeficiency
B) Cystic fibrosis
C) Hypogammaglobulinemia
D) Thymic-parathyroid dysplasia (DiGeorge syndrome)
E) X-linked agammaglobulinemia

Correct Answer: A.

Combined immunodeficiency describes a syndrome of failed B- and T-lymphocyte activity leading to impaired cellular and humoral immunity. There are a variety of causes of combined immunodeficiency. Adenosine deaminase deficiency is a frequent underlying cause. Patients present with numerous infections in early life, and characteristically manifest a combination of viral, bacterial, and fungal infections. Common infections include otitis media, oral thrush, pneumonia, gastroenteritis, and cutaneous fungal infections. Infants may demonstrate failure to thrive or developmental delay. The diagnosis is established through immune cell counts, mitogen assay, and genetic testing. Chest x-ray may also show the absence of a thymic shadow. Treatment is aimed toward appropriately preventing and treating infections. Currently, the only definitive treatment is bone marrow transplantation, although genetic therapies are under development in clinical trials.

Incorrect Answers: B, C, D, and E.

Cystic fibrosis (Choice B) is a syndrome resulting from defects in the *CFTR* gene, leading to a deficiency in a chloride channel that secretes chloride in the lungs and gastrointestinal tract, and reabsorbs chloride in sweat glands. Characteristic findings include bronchiectasis, recurrent pulmonary infections, pancreatic insufficiency, diarrhea, malnutrition, and weight loss. Patients with cystic fibrosis are not particularly vulnerable to extrapulmonary infections.

Hypogammaglobulinemia (Choice C) is often a result of failed B lymphocyte development and is seen in conditions such as X-linked agammaglobulinemia. X-linked agammaglobulinemia (Choice E) occurs as a result of mutations in the *BTK* gene that encodes a tyrosine kinase essential for all stages of B lymphocyte development and proliferation. Patients with X-linked agammaglobulinemia lack functioning B lymphocytes and therefore have recurrent infections caused by impaired humoral immunity. They do not typically demonstrate susceptibility to viral or fungal infections, which are typically combated by T lymphocytes.

Thymic-parathyroid dysplasia (DiGeorge syndrome) (Choice D) presents with thymic hypoplasia or aplasia and consequent impaired immunity, conotruncal cardiac defects, hypocalcemia caused by parathyroid hypoplasia, and craniofacial abnormalities.

Educational Objective: Combined immunodeficiency describes a syndrome of failed B- and T-lymphocyte activity leading to impaired cellular and humoral immunity. Patients present with numerous infections in early life, and characteristically manifest a combination of viral, bacterial, and fungal infections.

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10. Twenty-eight hours after undergoing uncomplicated elective right total knee replacement, a 76-year-old woman is alert and fully oriented but has nausea and pain in her right hip. Eight hours later, she is found unresponsive. She has hypertension. Her preadmission medication is lisinopril. Promethazine, hydromorphone, and enoxaparin were added to the regimen postoperatively. Her temperature is 37°C (98.6°F), pulse is 90/min, respirations are 6/min, and blood pressure is 90/50 mm Hg. Physical examination shows a clean surgical site with no drainage or bleeding. On neurologic examination, she does not respond to auditory stimuli. She responds to painful stimuli with a faint grimace. The eyes are closed; when the physician manually opens the patient's eyes, the pupils are 3 mm. There are no spontaneous movements of the extremities. The extremities do not move with painful stimuli. Which of the following is most likely to show the cause of this patient's change in level of consciousness?

A) Arterial blood gas analysis
B) Complete blood count
C) Complete metabolic profile
D) CT scan of the head
E) Pulmonary CT angiography

Correct Answer: A.

Opioid medications, such as hydromorphone, are useful in the treatment of postoperative pain. However, they are associated with several adverse effects and thus administration needs to be carefully titrated and monitored. One adverse effect associated with significant morbidity and mortality is respiratory depression, which occurs with the overdose of opioid pain medications. Respiratory depression can cause hypercarbia, which can lead to altered mental status, coma, and seizures. Opioid overdose can also lead to respiratory arrest and death. Given this patient's respiratory rate of 6 breaths per minute, hydromorphone overdose leading to hypoventilation and hypercarbia is the most likely cause of her change in level of consciousness. This is further supported by miosis on examination, a common sign of opioid intoxication. Hypercarbia secondary to hydromorphone use would most easily be identified on an arterial blood gas analysis, making this the best next step in determining the underlying cause of this patient's unresponsiveness.

Incorrect Answers: B, C, D, and E.

Complete blood count (Choice B) may indicate anemia if hemoglobin concentrations are decreased, or infection if leukocytosis is present. Severe anemia may result in unresponsiveness, but this would commonly present with profound hypotension and tachycardia, which this patient does not have. Similarly, severe infection, especially of the central nervous system, could produce unresponsiveness but would be expected to present with a fever. Thus, hydromorphone overdose leading to respiratory depression is the more likely cause.

Complete metabolic profile (Choice C) may show metabolic abnormalities, such as hypernatremia or hyponatremia, that may lead to altered mental status or unresponsiveness. However, these are more commonly seen with volume depletion or the syndrome of inappropriate antidiuretic hormone secretion, of which this patient has no other signs. Additionally, electrolyte abnormalities would be unlikely to explain her respiratory rate of 6 breaths per minute.

CT scan of the head (Choice D) can show intracranial processes that may lead to altered levels of consciousness, such as hemorrhage. This patient's only risk factor for stroke is hypertension. Additionally, she has no focal neurologic signs to suggest stroke. Thus, a CT scan of the head would be unlikely to reveal the cause of her unresponsiveness.

Pulmonary CT angiography (Choice E) is used in the diagnosis of pulmonary emboli. These most commonly present with dyspnea, tachypnea, tachycardia, and hypoxia. Hypotension can occur if they are large. This patient has bradypnea, making a pulmonary embolism unlikely.

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Pulmonary CT angiography (Choice E) is used in the diagnosis of pulmonary emboli. These most commonly present with dyspnea, tachypnea, tachycardia, and hypoxia. Hypotension can occur if they are large. This patient has bradypnea, making a pulmonary embolism unlikely.

Educational Objective: Opioid medications can lead to respiratory depression if not carefully titrated and monitored. This respiratory depression causes hypercarbia, which can result in altered mental status and unresponsiveness. If untreated, it can lead to respiratory arrest and death. Hypercarbia is most easily diagnosed with arterial blood gas analysis.

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11. A 78-year-old woman comes to the physician because of a 2-week history of mild right knee pain, especially when she walks up stairs. During this time, she also has had stiffness in her knee in the morning. She enjoys walking around her neighborhood but has been unable to walk because of the pain. She has gastroesophageal reflux disease and takes omeprazole occasionally. Vital signs are within normal limits. On examination, active and passive range of motion of the right knee is full; there is moderate crepitus and no effusion. Which of the following is the most appropriate pharmacotherapy?

A) Acetaminophen
B) Prednisone
C) Colchicine
D) Ibuprofen
E) Ciprofloxacin

Correct Answer: A.

Acetaminophen is the most appropriate medication to administer to this patient who most likely has osteoarthritis (OA). Older patients commonly develop OA in the fingers and in weight-bearing joints, such as the knees and hips. The characteristics of the pain are important in differentiating OA from inflammatory arthritis, such as rheumatoid arthritis, which can also present in older patients. OA pain tends to worsen throughout the day with continued use, whereas inflammatory pain tends to be worse in the morning and improve after about 1 hour of continual use. Brief stiffness in the morning may occur with OA but typically resolves within about 1 hour. The diagnosis is clinical, although plain film x-rays may be helpful and often show joint space narrowing, osteophyte formation, and subchondral sclerosis. First-line treatment of OA includes acetaminophen. Other medications include nonsteroidal anti-inflammatory drugs (NSAIDs), although these should be avoided in patients with a history of gastrointestinal bleeding or chronic kidney disease. Topical NSAID preparations are another viable alternative that provides relief to some patients without the systemic effects of oral NSAIDs.

Incorrect Answers: B, C, D, and E.

Prednisone (Choice B) is a viable treatment for acute gout attacks in patients who are unable to take NSAIDs or colchicine. It has little to no effect on OA and is associated with numerous adverse effects.

Colchicine (Choice C) is used to treat inflammatory arthritis and is classically used in the treatment of gout. It inhibits microtubule formation, thereby preventing white blood cell translocation into the joint, which limits joint space inflammation and associated arthropathy. It plays no role in the management of OA.

Ibuprofen (Choice D) is a reasonable alternative therapy for OA in patients who do not respond to acetaminophen. Acetaminophen is preferable for first-line treatment given the adverse effect profile of NSAIDs, which includes peptic ulcers and nephrotoxicity.

Ciprofloxacin (Choice E) is incorrect. Antibiotics may be warranted for the treatment of septic arthritis, which typically presents with fever, joint swelling, erythema, calor, and effusion. First-line treatment is primarily against the most frequent causative organisms, gram-positive cocci, and includes intravenous ceftriaxone or vancomycin, rather than ciprofloxacin.

Educational Objective: Osteoarthritis (OA) is a common condition leading to joint pain in older patients. OA pain tends to worsen throughout the day with continued use, whereas inflammatory pain tends to be worse in the morning and improve after about 1 hour of continual use. First-line therapy is acetaminophen.

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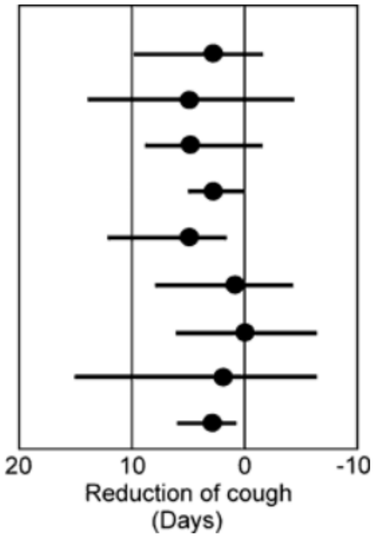
12. A meta-analysis of nine small, randomized-controlled trials is performed to evaluate the efficacy of inhaled corticosteroid therapy in patients with a persistent cough after an upper respiratory tract infection. Results of one of the trials show a statistically significant benefit with an average reduction in cough of 5 days in the treated group as compared with the control group. Two other studies show *p*-values for benefit of 0.07. The results of the studies are shown. Which of the following is the strongest rationale for performing a meta-analysis?



A) Decrease confounding
B) Decrease selection bias
C) Decrease type I error
D) Increase the confidence interval
E) Increase the power

Correct Answer: E.

While randomized controlled trials form the gold standard of medical research and generate more powerful evidence than other forms of observational or descriptive studies, they remain susceptible to error. A common form of error results from limitations in the number of study participants, which in turn limits statistical power, or the ability of the study to detect a difference between groups if one exists. Increasing the power of a study can generally be completed through a larger sample size and improving precision in measurements. When the power of a study is increased, the incidence of a type II error decreases. A type II error occurs when a study demonstrates no difference between the null and alternative hypotheses, when in fact, a difference exists. The type II error rate is calculated by subtracting the power from 100%. A meta-analysis is a form of study in which statistical analysis is performed to combine the results of multiple studies addressing the same question. Meta-analysis is useful for overcoming limitations of the constituent studies within the meta-analysis. By pooling the results of multiple studies, meta-analyses reduce the risk for type II error caused by the smaller sample sizes within each constituent randomized controlled trial. However, meta-analyses are susceptible to their own errors, primarily related to inclusion criteria, statistical methods, and the errors of constituent studies.

Incorrect Answers: A, B, C, and D.

Decrease confounding (Choice A) is incorrect. Confounding variables influence both the independent and dependent variables and can lead to false associations if the confounding variable is not evenly distributed in both study groups. Confounding is an inherent error within the structure of a constituent study and is not overcome by incorporation within a meta-analysis.

Decrease selection bias (Choice B) is incorrect. Selection bias occurs when there is a nonrandom or biased selection of individuals for inclusion in a particular study group, or for data analysis. Similar to confounding, it represents an inherent flaw within an individual study that is not overcome by inclusion within a meta-analysis.

Decrease type I error (Choice C) is incorrect. Type I error represents the likelihood of erroneously rejecting the null hypothesis (concluding that the alternative hypothesis is true). The acceptable rate of a type I error is a percentage called the alpha level and is set by the investigators. When the alpha level is converted to a decimal, it can be compared with the p-value of the experiment. An alpha level of 5% or 0.05 indicates that if the null hypothesis is true, there is a 5% chance that the investigators will erroneously reject it based on the study results. Inclusion within a meta-analysis does not inherently affect the risk for type I error.

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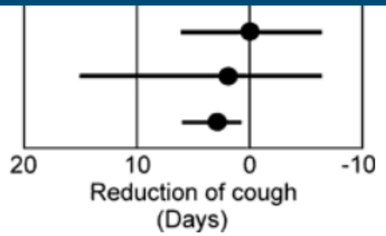
D) Increase the confidence interval

E) Increase the power



Correct Answer: E.

While randomized controlled trials form the gold standard of medical research and generate more powerful evidence than other forms of observational or descriptive studies, they remain susceptible to error. A common form of error results from limitations in the number of study participants, which in turn limits statistical power, or the ability of the study to detect a difference between groups if one exists. Increasing the power of a study can generally be completed through a larger sample size and improving precision in measurements. When the power of a study is increased, the incidence of a type II error decreases. A type II error occurs when a study demonstrates no difference between the null and alternative hypotheses, when in fact, a difference exists. The type II error rate is calculated by subtracting the power from 100%. A meta-analysis is a form of study in which statistical analysis is performed to combine the results of multiple studies addressing the same question. Meta-analysis is useful for overcoming limitations of the constituent studies within the meta-analysis. By pooling the results of multiple studies, meta-analyses reduce the risk for type II error caused by the smaller sample sizes within each constituent randomized controlled trial. However, meta-analyses are susceptible to their own errors, primarily related to inclusion criteria, statistical methods, and the errors of constituent studies.

Incorrect Answers: A, B, C, and D.

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Increase the confidence interval (Choice D) is incorrect. Confidence intervals are a measure of the precision of a statistical estimate. A 95% confidence interval indicates the range of outcomes expected on repeated trials. Confidence intervals are direct results of the sample size and outcomes of a constituent study and are not altered by inclusion within a meta-analysis. In general, well-conducted meta-analyses have narrower confidence intervals than their constituent studies, representing a greater degree of precision of statistical estimation.

Educational Objective: A meta-analysis is a form of study in which statistical analysis is performed to combine the results of multiple studies addressing the same question. Meta-analysis is useful for overcoming limitations of the constituent studies within the meta-analysis. By pooling the results of multiple studies, meta-analyses reduce the risk for type II error caused by the smaller sample sizes within each constituent randomized controlled trial.

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13. A 63-year-old woman comes to the office for an examination before undergoing ventral hernia repair. She has a 3-month history of increasingly severe abdominal cramps and low back pain, which are worse at night, and heartburn, which typically occurs after she pushes her grandson on a swing. She avoids most physical activity because of these symptoms. She has type 2 diabetes mellitus treated with metformin. Fifteen years ago, she underwent total abdominal hysterectomy for dysfunctional uterine bleeding. She smoked one pack of cigarettes daily for 8 years but quit 35 years ago. She is 160 cm (5 ft 3 in) tall and weighs 72 kg (160 lb); BMI is 28 kg/m^2. Vital signs are within normal limits. Cardiopulmonary examination shows no abnormalities. There is truncal obesity. A 10 × 10-cm, easily reducible mass is palpable under the midline scar. Which of the following is the most appropriate next step in management?

A) Cardiac stress scintigraphy
B) Pulmonary function testing
C) Recommendation for a low-sodium, low-fat diet
D) Recommendation to wear an abdominal binder
E) Switching from metformin to insulin

Correct Answer: A.

This patient has risk factors for coronary artery disease (age, diabetes mellitus, obesity, prior tobacco use), and the association of her symptoms with exertion warrants further workup. Cardiac stress testing is the next diagnostic step in management. There are multiple ways the stress test can be performed, and professional society guidelines provide various algorithms on selecting the appropriate test for each patient. The most important clinical factor to consider is whether the patient can tolerate exercise. Other factors to consider include underlying conduction abnormalities that may make an exercise stress test dangerous or difficult to interpret. For these patients, a pharmacologic stress test with cardiac imaging is the preferred test. Cardiac stress scintigraphy assesses myocardial perfusion at rest and under stress, which may be induced by exercise or vasodilators. It is the most sensitive noninvasive test for assessing coronary artery perfusion.

Incorrect Answers: B, C, D, and E.

Pulmonary function testing (Choice B) consists of spirometry, total body plethysmography, and diffusion capacity testing, and is useful in the workup and monitoring of respiratory disorders. This patient's symptoms are more concerning for a cardiac source.

Recommendation for a low-sodium, low-fat diet (Choice C) alone is not appropriate for this patient. The presence of symptoms with exertion and cardiovascular risk factors warrants further cardiac workup.

Recommendation to wear an abdominal binder (Choice D) will not address the likely cause of this patient's symptoms. Her abdominal pain and heartburn are likely presenting symptoms of coronary artery disease, and an abdominal binder will not provide relief.

Switching from metformin to insulin (Choice E) is not indicated, though this patient's hemoglobin A_{1c} should be checked as part of the workup to evaluate glycemic control. Appropriate management of diabetes mellitus reduces the risk for future cardiovascular disease.

Educational Objective: Patients with symptoms that are consistent with angina pectoris or with nonspecific symptoms exacerbated by exertion should undergo further evaluation with a stress test. Those who are capable of exercising should undergo either an exercise nuclear stress test or an exercise treadmill stress test.

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14. Physician A is approaching the end of his shift at the outpatient clinic when he hears the sound of glass breaking in Physician B's office. When Physician A enters Physician B's office to ensure that she is OK, he sees her cleaning up pieces of a wine glass. Physician B says she bought a bottle of wine earlier today and initially intended to bring it home, but she decided to open it and drink "a little" because she was stressed following a meeting with the department chair. Physician B says she was just about to go see her last patient of the day. Which of the following is the most appropriate immediate action by Physician A?

A) Explain the situation to the waiting patient
B) Inform Physician B that another staff physician will see the waiting patient
C) Notify the clinic administrator
D) Report Physician B to the state medical board
E) Report Physician B's behavior to the clinic's Medical Director

Correct Answer: B.

The most appropriate immediate action for physicians who witness that a colleague is intoxicated is to take steps to ensure that their colleague does not continue to see patients while impaired. The witnessing physician should then report the impairment to the appropriate authorities. Most state medical boards legally require this reporting. States typically provide physician health programs to evaluate, treat, and monitor physicians with substance use disorders or other impairing mental or physical conditions. The physician health program will assess whether the physician poses a danger to patients and may mandate that the physician temporarily withdraw from practice. Impaired physicians may present with mood changes, worsening personal hygiene, increased mistakes, decreased productivity, and/or decreased functioning in social interactions.

Incorrect Answers: A, C, D, and E.

Explaining the situation to the waiting patient (Choice A) would violate your colleague's privacy and is not necessary. It is more appropriate to tell the waiting patient that they will be seen by a different physician.

Reporting the impairment to the appropriate authorities, such as the state medical board (Choice D) or the clinic's Medical Director (Choice E), is appropriate but must be performed after ensuring that the impaired physician is no longer seeing patients in the clinic. Physicians should consult their local and state reporting guidelines, which may differ in their reporting requirements. In general, the clinic administrator (Choice C) is not the appropriate channel for reporting physician impairment.

Educational Objective: The most appropriate immediate action for physicians who witness that a colleague is intoxicated is to take steps to ensure that their colleague does not continue to see patients while impaired. Physicians should then report the impairment to the appropriate authorities.

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15. A 65-year-old man comes to the office for follow-up 5 days after discharge from the hospital, where he received treatment for an exacerbation of chronic obstructive pulmonary disease. Medical history otherwise is unremarkable. Medications are fluticasone-salmeterol, tiotropium, albuterol as necessary, and a 5-day prednisone taper; he also has 4 days remaining of a 7-day course of doxycycline. Since discharge, he has been taking his medications as directed and has noticed improvement in his breathing and decreased coughing. He smoked one pack of cigarettes daily for 50 years but quit before his hospital admission. He does not drink alcoholic beverages. Vital signs are pulse 90/min, respirations 20/min, and blood pressure 120/80 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. Auscultation of the lungs discloses decreased breath sounds with occasional wheezing and no crackles. Cardiac examination discloses a soft S_1 and S_2. There is no clubbing of the digits or edema of the extremities. In considering this patient's risk for readmission, which of the following is the most appropriate management?

A) Incentive spirometry
B) Long-term prednisone therapy
C) Oxygen therapy
D) Pulmonary rehabilitation
E) Suppressive azithromycin therapy three times weekly

Correct Answer: D.

Pulmonary rehabilitation is recommended for patients with Global Initiative for Chronic Obstructive Lung Disease (GOLD) group B, C, or D chronic obstructive pulmonary disease (COPD) as it has been shown to improve symptoms and quality of life as well as reduce hospital readmissions for COPD exacerbations. These are patients who experience moderate to severe COPD symptoms or are at high risk for exacerbations and hospitalization. Pulmonary rehabilitation is primarily exercise training to improve conditioning and strengthen respiratory muscles, but many programs also offer lifestyle and behavioral counseling as well as psychological and social support. Many patients with COPD also benefit from breathing retraining to improve ventilation by avoiding rapid, shallow breathing. This reduces air trapping and dead space ventilation.

Incorrect Answers: A, B, C, and E.

Incentive spirometry (Choice A) is useful to prevent pulmonary complications in postoperative patients and improve ventilation in patients with atelectasis. It does not have a significant role in routine management of COPD.

Long-term prednisone therapy (Choice B) is not recommended for management of COPD because of serious adverse effects with chronic use and increased risk for morbidity and mortality. Short-term use of systemic glucocorticoids is standard in treatment of acute exacerbations.

Oxygen therapy (Choice C) is strongly recommended for COPD patients with chronic, exertional, or nocturnal hypoxemia, as it has been shown to improve overall survival in patients with peripheral oxygen saturations of 88% or less. This patient demonstrates adequate oxygenation, and oxygen therapy is unlikely to provide benefit at this time.

Suppressive azithromycin therapy three times weekly (Choice E) is considered for patients with severe COPD who continue to have exacerbations despite maximal bronchodilator therapy. Azithromycin provides both antimicrobial and anti-inflammatory benefits, though it is reserved for specific clinical situations because of the risks of antibiotic resistance and long-term cardiovascular effects.

Educational Objective: Pulmonary rehabilitation is recommended for patients with Global Initiative for Chronic Obstructive Lung Disease (GOLD) group B, C, or D chronic obstructive pulmonary disease (COPD). These are patients who experience moderate to severe COPD symptoms or are at high risk for exacerbations and hospitalization. It has been shown to improve symptoms and quality of life as well as reduce hospital readmissions and durations of stay for exacerbations.

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16. A 32-year-old primigravid woman at 16 weeks' gestation comes to the physician for a prenatal visit. She has bipolar disorder. Her medications are lithium carbonate and a prenatal vitamin. Physical examination shows a uterus consistent in size with a 16-week gestation. On mental status examination, she is cooperative and fully oriented. She has a euthymic mood and congruent affect. Thought processes are linear. She reports reading about the possible adverse effects of mood stabilizers on the developing fetus and asks if she should stop taking lithium carbonate. Which of the following is the most appropriate recommendation regarding this patient's medication regimen during pregnancy?

A) Discontinue mood stabilizer pharmacotherapy
B) Switch from lithium carbonate to carbamazepine
C) Switch from lithium carbonate to clozapine
D) Switch from lithium carbonate to valproic acid
E) Continue the current regimen

Correct Answer: E.

Lithium is a mood stabilizing medication utilized to treat acute mania and as maintenance treatment in bipolar disorder to prevent the recurrence of manic or depressive episodes. Lithium readily crosses the blood-placental barrier. There is mixed evidence that lithium is associated with an increase in the rate of cardiac malformations if used during the first trimester. In particular, there may be an approximately 1- to 2-fold increase in the rate of Ebstein anomaly, in which the tricuspid valve leaflets are displaced toward the right ventricle, with subsequent right ventricular atrialization and increased risk for supraventricular tachycardia or Wolff-Parkinson-White syndrome. However, the overall rate of Ebstein anomaly remains low even when lithium is continued during the first trimester, and the risk for potential fetal abnormalities must be weighed against the risks to both the mother and fetus associated with acute manic or depressive episodes, which may include death. Data on long-term developmental outcomes following fetal lithium exposure is scarce. This patient presents after the first trimester, at which time, organogenesis has already occurred. In this setting, lithium should be continued to minimize the risk for exacerbation of the patient's bipolar disorder. If continued during pregnancy, careful dose monitoring should be performed, as dose adjustments are often necessary because of lithium's narrow therapeutic window and changes in body weight and metabolism associated with pregnancy. Fetal cardiac ultrasonography is recommended if lithium is continued during pregnancy.

Incorrect Answers: A, B, C, and D.

Discontinue mood stabilizer pharmacotherapy (Choice A) is not recommended and is associated with a substantial increase in the risk for exacerbations of bipolar disorder and suicide especially in the setting of pregnancy.

Switch from lithium carbonate to carbamazepine (Choice B) is not recommended. Carbamazepine is a voltage-gated sodium channel blocker and can be used as a mood stabilizer in bipolar disorder or as an antiepileptic. It is associated with neural tube defects. In general, switching from one mood stabilizer to another is associated with an increased risk for illness exacerbation. This patient has done well on lithium, is past the first trimester, and should continue lithium treatment.

Switch from lithium carbonate to clozapine (Choice C) is incorrect. Clozapine is an antipsychotic used to treat refractory schizophrenia. Its major toxicities include agranulocytosis, which can be severe and life threatening in the setting of infection.

Switch from lithium carbonate to valproic acid (Choice D) is incorrect. Valproic acid is an antiepileptic drug and mood stabilizer that is occasionally used to treat patients with schizoaffective or bipolar disorder. It is associated with cardiac, craniofacial, and developmental fetal abnormalities, and should be avoided during pregnancy.

Educational Objective: Lithium may be continued during pregnancy, including the first trimester, under specific circumstances in women with bipolar disorder. The risk for potential fetal abnormalities in

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B) Switch from lithium carbonate to carbamazepine
C) Switch from lithium carbonate to clozapine
D) Switch from lithium carbonate to valproic acid
E) Continue the current regimen

Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

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Educational Objective: Lithium may be continued during pregnancy, including the first trimester, under specific circumstances in women with bipolar disorder. The risk for potential fetal abnormalities, in particular Ebstein anomaly, must be discussed with the patient and weighed against the potentially severe risks to both the mother and fetus associated with exacerbations of the psychiatric disorder. Most data suggest that lithium is safe during pregnancy after the first trimester. Lithium levels should be monitored carefully during pregnancy and fetal cardiac ultrasonography should be performed.

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17. A 30-year-old primigravid woman at 10 weeks' gestation comes to the physician for her first prenatal visit. She has polycystic ovarian syndrome. She conceived following clomiphene therapy, and her only current medication is a prenatal vitamin. She is 165 cm (5 ft 5 in) tall and weighs 82 kg (180 lb); BMI is 30 kg/m^2. Examination shows a uterus consistent in size with a 10-week gestation. Which of the following is the most appropriate recommendation for this patient during her pregnancy?

A) Amniocentesis
B) Cesarean delivery
C) Chorionic villus sampling
D) Limiting pregnancy weight gain
E) Measurement of serum fasting insulin concentration

Correct Answer: D.

The initial prenatal visit is imperative to a healthy pregnancy. It allows the practitioner to assess the patient's current health status, intervene to prevent complications, and educate the patient. During the visit, the obstetrician can complete a comprehensive history and physical examination, as well as order appropriate laboratory testing and imaging. This visit should specifically include an assessment of immunization status, substance use, medical problems, family history of heritable diseases, height, weight, and baseline vital signs, such as blood pressure. Recommendations for weight gain during pregnancy, which can be established at this initial prenatal visit, are based on a patient's prepregnancy BMI. Those who are underweight are recommended to gain 28 to 40 pounds, while those with obesity are recommended to gain 11 to 20 pounds. This is because patients who are underweight are at increased risk for having newborns who are small for gestational age, whereas patients with obesity are at increased risk for having newborns who are large for gestational age. Additional weight gain in patients with baseline obesity can also increase the risk for gestational hypertension and preeclampsia, gestational diabetes, and cesarean delivery. Thus, the most appropriate recommendation for this patient is to limit pregnancy weight gain to the recommended 11 to 20 pounds to prevent pregnancy complications. This is additionally important given her history of polycystic ovarian syndrome, which increases her risk for diabetes.

Incorrect Answers: A, B, C, and E.

Amniocentesis (Choice A) is used to diagnose a congenital genetic abnormality in the fetus, such as trisomy 18. It may also be used in the evaluation of hemolytic anemia or neural tube defects and can be used therapeutically for polyhydramnios. As it is an invasive procedure and associated with risk to the fetus, it is reserved for diagnostic confirmation after a noninvasive test, such as cell-free DNA or ultrasonography. This patient currently has no need to undergo amniocentesis.

Cesarean delivery (Choice B) is not indicated at this time. Cesarean deliveries are the preferred form of delivery for breech presentations or placental abnormalities, though they are also indicated following arrest of labor. While this patient may require a cesarean delivery, it is not yet possible to predict the likelihood of her having one.

Chorionic villus sampling (Choice C) is an invasive test used to identify genetic abnormalities of the fetus. As it carries risk to the fetus, it is often reserved for further evaluation of abnormalities on aneuploidy screening or ultrasonography. There is no indication of a genetic abnormality in this patient, making chorionic villus sampling an inappropriate recommendation at this time.

Measurement of serum fasting insulin concentration (Choice E) is not frequently done in pregnant patients. More commonly, patients undergo oral glucose testing to evaluate for gestational diabetes, which can be associated with a variety of maternal and fetal complications. This occurs at approximately 24 to 28 weeks of gestation.

Educational Objective: The initial prenatal visit is imperative to a healthy pregnancy as it allows obstetricians to complete a comprehensive history and physical examination, as well as order appropriate

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A) Amniocentesis
B) Cesarean delivery
C) Chorionic villus sampling
D) Limiting pregnancy weight gain
E) Measurement of serum fasting insulin concentration

Correct Answer: D.

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Measurement of serum fasting insulin concentration (Choice E) is not frequently done in pregnant patients. More commonly, patients undergo oral glucose testing to evaluate for gestational diabetes, which can be associated with a variety of maternal and fetal complications. This occurs at approximately 24 to 28 weeks of gestation.

Educational Objective: The initial prenatal visit is imperative to a healthy pregnancy as it allows obstetricians to complete a comprehensive history and physical examination, as well as order appropriate laboratory testing and imaging. Recommendations for weight gain during pregnancy, which can be established at this initial prenatal visit, are based on a patient's prepregnancy BMI. Patients with obesity are encouraged to limit pregnancy weight gain, as excessive weight gain is associated with newborns who are large for gestational age, gestational hypertension and preeclampsia, gestational diabetes, and cesarean delivery.

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✓ 18. A previously healthy 57-year-old man comes to the emergency department 1 hour after the sudden onset of severe occipital headache. His temperature is 37.2°C (99°F), pulse is 92/min, respirations are 18/min, and blood pressure is 180/98 mm Hg. He is mildly lethargic but oriented to person, place, and time. Neurologic examination shows no other abnormalities. A CT scan of the head shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Measurement of erythrocyte sedimentation rate
B) Measurement of intraocular pressure
C) Carotid duplex ultrasonography
D) MRI of the brain with contrast
E) Intravenous prochlorperazine therapy
F) Cerebrospinal fluid analysis

Correct Answer: F.

Noncontrast CT scan of the head is a highly sensitive, but not perfectly sensitive, method for the detection of subarachnoid hemorrhage (SAH), which must be excluded in the setting of a severe headache presenting with hypertension. CT scan is most sensitive to detect SAH when performed within 6 hours from the onset of symptoms and may reveal hyperdense blood products in the subarachnoid space or ventricles. The sensitivity of a CT scan for SAH declines over time from the onset of bleeding or with smaller volume hemorrhages. Patients with a presenting history concerning for SAH who have a negative CT scan should undergo emergent lumbar puncture for cerebrospinal fluid analysis. Lumbar puncture is useful for identifying findings of SAH, including xanthochromia, increased opening pressure, and/or an increased cerebrospinal fluid concentration of red blood cells that does not clear across several tubes of collected fluid.

Incorrect Answers: A, B, C, D, and E.

Measurement of erythrocyte sedimentation rate (Choice A) is useful for the diagnosis of temporal arteritis. Temporal arteritis is rare in patients younger than age 50 years. It typically presents with unilateral or bilateral temporal headaches of subacute onset that are often accompanied by jaw claudication, amaurosis fugax, or sudden vision loss. This patient's history of severe, acute headache is more consistent with SAH.

Measurement of intraocular pressure (Choice B) is useful for the diagnosis of acute or chronic glaucoma. Glaucoma occurs as a result of increases in pressure within the anterior chamber of the eye, and may present as acute, painful or chronic, painless vision loss.

Carotid duplex ultrasonography (Choice C) is useful for the diagnosis of carotid stenosis but has little role in the diagnosis of SAH.

MRI of the brain with contrast (Choice D) has high sensitivity for the detection of SAH, tumor, or abscess, but is a time-consuming study and will result in a delay in treatment. Lumbar puncture allows for the more immediate detection of SAH.

Intravenous prochlorperazine therapy (Choice E) would be useful in the treatment of a primary headache such as migraine. However, this patient's history is concerning for SAH, and further diagnostic evaluation is warranted.

Educational Objective: Noncontrast CT scan of the head has a high but not perfect rate of sensitivity for the detection of subarachnoid hemorrhage (SAH). Patients with a presenting history concerning for

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A) Measurement of erythrocyte sedimentation rate
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C) Carotid duplex ultrasonography
D) MRI of the brain with contrast
E) Intravenous prochlorperazine therapy
F) Cerebrospinal fluid analysis

Correct Answer: F.

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Incorrect Answers: A, B, C, D, and E.

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Educational Objective: Noncontrast CT scan of the head has a high but not perfect rate of sensitivity for the detection of subarachnoid hemorrhage (SAH). Patients with a presenting history concerning for SAH who have a negative CT scan should undergo emergent lumbar puncture for cerebrospinal fluid analysis, which may reveal xanthochromia, increased opening pressure, and/or a persistently increased cerebrospinal fluid concentration of red blood cells.

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19. A 45-year-old woman comes to the clinic because of a 2-month history of increasingly severe epigastric pain, bloating, and intermittent nausea and vomiting. During this time, she has had decreased appetite resulting in a 3.6-kg (8-lb) weight loss. She has hypertension and type 2 diabetes mellitus. The conditions have been poorly controlled during the past 2 years, because she has not been adherent to her medication regimen. The patient has no history of operative procedures. Medications are metformin, insulin glargine, atorvastatin, lisinopril, and daily aspirin. She appears well. She is 157 cm (5 ft 2 in) tall and weighs 91 kg (200 lb); BMI is 37 kg/m^2. Temperature is 37.0°C (98.6°F), pulse is 78/min, respirations are 12/min, and blood pressure is 124/68 mm Hg. The abdomen is protuberant; there is no organomegaly or tenderness to palpation. Bowel sounds are decreased. Results of a complete blood count, metabolic profile, and determination of serum lipase activity are within the reference ranges. Which of the following is the most appropriate next step in diagnosis?

A) Endoscopic retrograde cholangiopancreatography
B) Esophageal manometry
C) Gastric emptying study
D) MRI of the abdomen
E) Ultrasonography of the abdomen

Correct Answer: C.

Diabetic neuropathy is a microvascular complication of long-standing diabetes mellitus that typically presents in a “stocking and glove” distribution of the hands and feet. If associated neuropathy of the autonomic nervous system occurs, this can result in complications such as diabetic gastroparesis or dysautonomia. Gastroparesis typically presents with slowly progressive early satiety, nausea, vomiting of undigested food, and abdominal bloating with a succussion splash heard during physical examination. The diagnosis can be confirmed with a nuclear medicine gastric emptying study. A gastric emptying scan is considered the gold standard diagnostic test and is performed by the ingestion of a radiolabeled tracer, commonly technetium 99m, which evaluates the rate of emptying of contents from the stomach. Gastroparesis may be treated with agents that increase gastrointestinal contraction and motility, such as the D_2 receptor antagonist metoclopramide. Erythromycin is also used as it is an agonist of the hormone motilin.

Incorrect Answers: A, B, D, and E.

Endoscopic retrograde cholangiopancreatography (Choice A) is utilized for the evaluation and treatment of various biliary pathologies. It does not play a role in the evaluation of diabetic gastroparesis.

Esophageal manometry (Choice B) is useful for the diagnosis of achalasia and diffuse esophageal spasm, but it is not useful for the diagnosis of gastroparesis.

MRI of the abdomen (Choice D) is useful for the diagnosis of certain abdominal malignancies, such as hepatocellular carcinoma, renal carcinoma, or metastases to the liver.

Ultrasonography of the abdomen (Choice E) may demonstrate gastric distension but is not useful for assessing gastric motility.

Educational Objective: Diabetic autonomic neuropathy may cause gastroparesis, which presents with early satiety, nausea, vomiting of undigested food, bloating, and a succussion splash. The diagnosis can be confirmed with a nuclear medicine gastric emptying study.

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20. A 54-year-old man comes to the office because of a 3-week history of a dull ache along the back of his left ankle that is worse in the morning when he gets out of bed. The pain also worsens when he plays tennis on weekends. Acetaminophen once daily has provided moderate relief of the pain. Medical history is unremarkable, and the patient takes no other medications. He is 178 cm (5 ft 10 in) tall and weighs 99 kg (219 lb); BMI is 31 kg/m^2. Vital signs are within normal limits. The patient appears well. There is mild swelling and tenderness to palpation at the proximal aspect of the Achilles tendon. The remainder of the examination discloses no abnormalities. Thompson test is negative. In addition to recommending rest, which of the following is the most appropriate next step in management?

A) Add oxycodone as needed for pain
B) Increase the frequency of acetaminophen to four times daily
C) Inject cortisone into the calcaneal insertion site of the Achilles tendon
D) Recommend physical therapy
E) Schedule surgical intervention for the Achilles tendon

Correct Answer: D.

Achilles tendinopathy is a common overexertion injury that presents as posterior heel pain. Most heel pain is caused by mechanical musculoskeletal pathology, though it is important to evaluate for other causes including inflammatory conditions (eg, gout, rheumatoid arthritis), infections (especially in patients with diabetes mellitus or arterial insufficiency), and neurologic disorders (eg, neuroma, lumbosacral radiculopathy, peripheral nerve entrapment). The location of the pain is the best indicator of the underlying pathology. The Thompson test is used to assess the integrity of the Achilles tendon. A positive test indicates significant or complete rupture of the Achilles tendon and requires more aggressive management. Mild tendinopathy associated with activity can be treated conservatively with rest, icing, compression, and over-the-counter nonsteroidal anti-inflammatory drugs. The physician should also recommend physical therapy directed at gentle stretching and strengthening of the affected tendon. The goal of therapy is a return to activity.

Incorrect Answers: A, B, C, and E.

Add oxycodone as needed for pain (Choice A) is not indicated for Achilles tendinopathy. Ice, gentle stretching, physical rehabilitation, and nonsteroidal anti-inflammatory drugs are recommended.

Increase the frequency of acetaminophen to four times daily (Choice B) is not likely to provide as much benefit as physical therapy but may be considered as an adjunct. Nonsteroidal anti-inflammatory drugs are recommended for short-term relief for patients who do not have a contraindication for their use.

Inject cortisone into the calcaneal insertion site of the Achilles tendon (Choice C), and other injection therapies, may be considered if the patient continues to have symptoms despite appropriate treatment and engagement in physical therapy, though the evidence for their efficacy is limited. Some studies show an increased risk for tendon rupture after injection with glucocorticoids.

Schedule surgical intervention for the Achilles tendon (Choice E) is not indicated for this degree of injury. Surgery may be considered for cases of complete tendon rupture, though the benefits and risks are comparable to nonoperative management strategies.

Educational Objective: Heel pain is a common presenting complaint, and the clinician must be careful to distinguish a musculoskeletal overexertion injury from other pathology. Achilles tendinopathy can be treated with rest, icing, compression, nonsteroidal anti-inflammatory drugs, and physical therapy.

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21. A 10-year cohort study is conducted to investigate the effect of cigarette smoking on the incidence of head and neck cancers in adults. A total of 10,000 adult participants with no history of any type of cancer are enrolled in the study; 2000 participants are current cigarette smokers and 8000 are current nonsmokers and have never smoked cigarettes. During the 10-year study period, 20 smokers and eight nonsmokers develop head and neck cancer. Based on these data, which of the following best represents the attributable risk from smoking for head and neck cancer among current cigarette smokers?

A) 0.001
B) 0.009
C) 0.01
D) 0.09
E) 0.1

Correct Answer: B.

Attributable (excess) risk (AR) describes the risk for developing disease or the outcome under study (in this case, development of head and neck cancers) that can be attributed to the exposure as compared with the risk that exists without the exposure. AR is calculated as the difference between disease or outcome incidence among those with the exposure and those without the exposure. In biostatistics, the lowercase letters a, b, c, and d are frequently used to represent numbers of patients exposed to a risk, receiving an intervention, or having a disease. The number of persons having the exposure or receiving the intervention who have the disease or condition in question is represented by 'a'. The number of persons having the exposure or receiving the intervention who do not have the disease or condition in question is represented by 'b'. The number of persons who do not have the exposure or who do not receive the intervention in question, and who do have the disease or condition, is represented by 'c'. The number of persons who do not have the exposure or who do not receive the intervention in question, and who do not have the disease, is represented by 'd'. By this convention, the incidence of those with the exposure is computed by determining the number of patients with the exposure and who developed disease (a) and dividing it by the total number of patients who were exposed (a + b). The incidence of those without the exposure who developed disease is computed by determining the number of patients without the exposure who developed disease (c) and dividing it by the total number of patients who were not exposed (c + d). AR is defined as AR = (a / (a + b)) - (c / (c + d)). In this scenario, the AR can be determined by (20 /(20 + 1980)) – (8 /(8 + 7992)) = 20/2000 – 8/8000 = 0.010 – 0.001 = 0.009.

Incorrect Answers: A, C, D, and E.

0.001 (Choice A) represents an incorrect mathematical assumption involving the calculation of (c / (c + d)), which represents the incidence of those without the exposure who developed disease.

0.01 (Choice C) represents the number of persons with the exposure who developed disease but does not factor out the number who developed it without the exposure.

0.09 (Choice D) involves an incorrect mathematical assumption involving (a / (a + b)) - (c / (c + d)) multiplied by the duration of the study in years.

0.1 (Choice E) involves an incorrect mathematical assumption involving (a / (a + b)) multiplied by the duration of the study in years.

Educational Objective: Attributable risk describes the risk for developing disease or the outcome that can be attributed to the exposure as compared with the risk that exists without the exposure. It is calculated as the difference between disease or outcome incidence among those with the exposure and those without the exposure.

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22. A 15-year-old girl is brought to the office for a well-child examination. She has no history of serious illness and takes no medications. Her temperature is 36.9°C (98.4°F), pulse is 86/min, respirations are 16/min, and blood pressure is 100/60 mm Hg. A photograph of the back is shown. The remainder of the examination shows no abnormalities. In addition to routine annual growth and development assessments, which of the following is the most appropriate recommendation regarding routine screening in this patient?

A) Yearly CT scan of the chest and abdomen
B) Yearly MRI of the brain
C) Yearly nerve conduction studies
D) Yearly ophthalmologic examination
E) No additional screening is indicated

Correct Answer: D.

Neurofibromatosis type 1 is an autosomal dominant neurocutaneous disorder that typically results from an inherited mutation of the *NF1* tumor suppressor gene on chromosome 17. Neurofibromatosis type 1 is inherited with complete penetrance and variable expressivity. Rarely, the mutation in the *NF1* gene occurs sporadically. The disorder presents with cutaneous neurofibromas (ie, benign neoplasms derived from neural crest cells), cafe-au-lait spots, axillary or inguinal freckling, pigmented iris hamartomas (eg, Lisch nodules), optic pathway gliomas (OPGs), and/or pheochromocytomas. According to guidelines from the American Academy of Pediatrics (AAP), patients with neurofibromatosis type 1 require annual, multidisciplinary screening, including ophthalmic, neurologic, and dermatologic examinations, blood pressure monitoring, and growth and bone health monitoring. Ophthalmic examination is useful for the early detection and treatment of OPGs, which tend to occur before age 6 years. Treatment includes surgical debulking of tumors, management of seizures and neurologic complications, and genetic counseling.

Incorrect Answers: A, B, C, and E.

The use of routine diagnostic imaging in asymptomatic children with neurofibromatosis type 1, such as with CT scan of the chest and abdomen (Choice A) or MRI of the brain (Choice B) remains controversial. According to the most recent AAP 2019 guidelines, diagnostic imaging studies should be performed as needed. Routine ophthalmic examination and visual field testing is often sufficiently sensitive to detect the presence of OPGs.

Yearly nerve conduction studies (Choice C) are not necessary for the detection of new neurofibromas. If a new clinically relevant neurofibroma is suspected based on neurologic symptoms, dedicated

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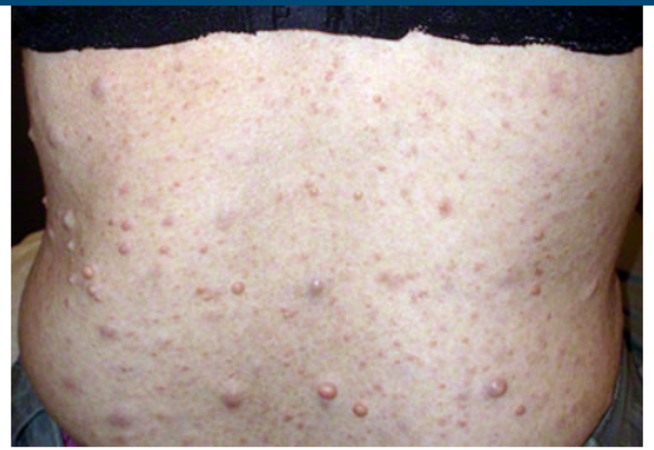
D) Yearly ophthalmologic examination

E) No additional screening is indicated



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The use of routine diagnostic imaging in asymptomatic children with neurofibromatosis type 1, such as with CT scan of the chest and abdomen (Choice A) or MRI of the brain (Choice B) remains controversial. According to the most recent AAP 2019 guidelines, diagnostic imaging studies should be performed as needed. Routine ophthalmic examination and visual field testing is often sufficiently sensitive to detect the presence of OPGs.

Yearly nerve conduction studies (Choice C) are not necessary for the detection of new neurofibromas. If a new clinically relevant neurofibroma is suspected based on neurologic symptoms, dedicated neuroimaging with MRI is the preferred diagnostic modality.

No additional screening (Choice E) is incorrect. Neurofibromatosis type 1 can lead to significant medical complications related to the presence of OPGs and pheochromocytoma if appropriate screening is not performed.

Educational Objective: Neurofibromatosis type 1 is an autosomal dominant neurocutaneous disorder that presents with cutaneous neurofibromas, cafe-au-lait spots, axillary or inguinal freckling, pigmented iris hamartomas (eg, Lisch nodules), optic pathway gliomas (OPGs), and/or pheochromocytomas. Annual screening is multidisciplinary and includes ophthalmic screening to detect OPGs.

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✓ 23. A 7-year-old girl is brought to the physician by her mother because she is concerned that her daughter has had two episodes of vaginal bleeding during the past 3 months. She also has had breast development during this time. Development had been appropriate for age. She is at the 48th percentile for height and 47th percentile for weight and BMI. Breast development is sexual maturity rating (SMR) stage 2, and axillary and pubic hair development is SMR stage 3. Examination shows normal-appearing external genitalia. Pelvic examination is deferred. An MRI of the pelvis shows a normal vagina and cervix. The uterus is 4 cm long, and a 7 × 6-cm left ovarian mass is seen. Which of the following is the most appropriate next step in management?

A) Chromosomal analysis
B) Measurement of serum CA 125 concentration
C) CT scan of the pituitary gland
D) Fine-needle aspiration of the mass
E) Left oophorectomy

Correct Answer: E.

Puberty refers to the normal hormonal and physiologic changes that occur as children age. The most common age range for the onset of puberty in females is age 9 to 12 years, although this can vary markedly among patients based on factors such as body weight and ethnicity. Precocious puberty refers to the onset of secondary sexual characteristics before the age of 8 years in females or 9 years in males. It can be idiopathic or have a variety of causes, such as central nervous system lesions, ovarian or germ cell tumors, adrenal disorders, or genetic defects such as McCune-Albright syndrome. Precocious puberty can be further defined as central or peripheral. Central precocious puberty is caused by an early activation of the hypothalamic-pituitary-gonadal axis, whereas peripheral precocious puberty is caused by the excessive release of estrogens or androgens. Ovarian tumors, such as sex cord-stromal tumors, can present with precocious puberty in children, which is the likely cause in this patient given the MRI findings. As they may be malignant, the most appropriate next step in management of this patient's condition is left oophorectomy to remove the ovarian mass.

Incorrect Answers: A, B, C, and D.

Chromosomal analysis (Choice A) is not necessary. While some genetic mutations can cause precocious puberty, they are extraordinarily rare and would not be evident on chromosomal analysis. Additionally, this patient has a large ovarian mass, making this a more likely cause of her precocious puberty.

Measurement of serum CA 125 concentration (Choice B) is occasionally used in the diagnosis of ovarian cancer. However, it is nonspecific and would not confirm the diagnosis in this patient. Surgical resection would allow histologic analysis of the mass and would also likely improve this patient's symptoms.

CT scan of the pituitary gland (Choice C) can be considered in the evaluation of precocious puberty as central nervous system lesions can lead to overactivation of the hypothalamic-pituitary-gonadal axis. However, this patient has a large mass of the left ovary and would be unlikely to also have an intracranial lesion in the absence of other symptoms.

Fine-needle aspiration of the mass (Choice D) would be a less appropriate option than surgical resection of the mass. In addition to the risk for seeding the abdomen if the mass is malignant, delaying the time to operative removal of the mass will delay the time until this patient's symptoms resolve. Similarly, if the mass is malignant, a delay in surgical resection increases the risk for metastasis.

Educational Objective: Ovarian tumors, specifically sex cord-stromal tumors, can cause precocious puberty in children. Precocious puberty refers to the onset of secondary sexual characteristics before the age of 8 years in females or 9 years in males. It can be idiopathic or have a variety of other causes, such as central nervous system lesions, adrenal disorders, or genetic defects such as McCune-Albright syndrome. When caused by an ovarian tumor, treatment with surgical resection is required.

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24. A 3-year-old boy is brought to the physician because of a scaling lesion on the scalp for 7 days. The family has no pets; the day-care center that the child attends has a pet turtle. The other children at the day-care center are asymptomatic. Examination of the scalp shows a thin plaque with alopecia and scaling. Which of the following is the most appropriate pharmacotherapy to prevent spread to the children in the day-care center?

A) Oral griseofulvin for the patient only
B) Oral griseofulvin for the patient and his classmates
C) Topical hydrocortisone for the patient only
D) Topical hydrocortisone for the patient and his classmates
E) Topical selenium sulfide for the patient only
F) Topical selenium sulfide for the patient and his classmates

Correct Answer: A.

Tinea capitis is a fungal infection of the scalp that is common in children. It presents as scaly patches with alopecia, patches of alopecia with black dots that represent broken hairs, and cervical lymphadenopathy. The most common causal organism is *Trichophyton tonsurans*, although infections can also be caused by other *Trichophyton*, *Microsporum*, and *Epidermophyton* species. A potassium hydroxide preparation of a skin scraping will show fungal hyphae or spores. It is treated with oral antifungals, such as griseofulvin or terbinafine.

Incorrect Answers: B, C, D, E, and F.

Treatment of classmates (Choices B, D, and F) is not typically necessary. While tinea capitis may be transmitted through close contacts in schools or day-care centers, or zoonotically, commonly through dogs, cats, or livestock, it is not necessary to treat close contacts who are otherwise asymptomatic.

Topical hydrocortisone for the patient only (Choice C) is useful for the treatment of atopic dermatitis. It is not useful for the treatment of, and may worsen, tinea capitis.

Topical selenium sulfide for the patient only (Choice E) is incorrect. Selenium sulfide is an antifungal that is used topically as a lotion or shampoo in the treatment of pityriasis versicolor, dandruff, or seborrheic dermatitis. It is not effective against tinea capitis.

Educational Objective: Tinea capitis presents commonly in children as scaly patches, hair loss, and cervical lymphadenopathy. A frequent causative organism is *Trichophyton tonsurans*. It is treated with oral antifungals, such as griseofulvin or terbinafine.

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25. A 5-year-old boy is brought to the physician by his parents as a new patient because they are concerned that he may have an immunodeficiency. The family recently moved to the area. The parents say their son's previous physician had been examining him for the condition. The patient has had six episodes of pneumonia and 10 episodes of sinusitis since birth. He underwent uncomplicated surgical drainage of the sinuses at the ages of 3 and 4 years. He had his first episode of otitis media at the age of 2 months and underwent uncomplicated placement of tympanostomy tubes at the age of 7 months. His umbilical stump fell off at the age of 2 weeks. The patient's previous leukocyte, lymphocyte, and platelet counts; serum immunoglobulin and CH50 concentrations; and diphtheria, tetanus, pneumococcal, and *Haemophilus influenzae* type b titers are within the reference ranges. Six previous chest x-rays showed lower lobe consolidations in inconsistent locations; subsequent x-rays showed clearing of the infiltrates. Today, vital signs are within normal limits. Examination shows no abnormalities. A CT scan of the chest is shown. Which of the following is the most likely diagnosis?

A) Common variable immunodeficiency
B) Complement deficiency
C) Leukocyte adhesion defect
D) Primary ciliary dyskinesia
E) Wiskott-Aldrich syndrome

Correct Answer: D.

Primary ciliary dyskinesia (PCD), also referred to as immotile-cilia syndrome, is a rare congenital disorder characterized by defective cilia and an inability to clear mucus and debris from the airways. There are numerous mutations that can cause the syndrome, resulting either in impaired ciliary function or absent cilia. Clinical manifestations vary, though most patients will experience recurrent upper and lower respiratory infections. Other manifestations include chronic rhinosinusitis, otitis media, and infertility. Notably, approximately half of patients with PCD will have situs inversus. Kartagener syndrome refers to the subset of patients with PCD who have the clinical triad of situs inversus, chronic sinusitis, and bronchiectasis.

Incorrect Answers: A, B, C, and E.

Common variable immunodeficiency (Choice A) classically presents in the second to fourth decades of life as multiple, recurrent sinus or pulmonary infections, including pneumonia, bronchitis, and sinusitis. Testing will show low immunoglobulin concentrations.

Complement deficiency (Choice B), particularly of the terminal complement proteins, prevents the formation of the membrane attack complex, which is a critical component in the complement cascade, typically leading to the formation of a pore in the membrane of pathogenic organisms. Deficiency predisposes patients to recurrent and invasive infections with *Neisseria* species.

Leukocyte adhesion defect (LAD) (Choice C) disorders are characterized by impaired attachment of leukocytes to the vascular endothelium, and recruitment and migration of leukocytes to sites of extravascular inflammation or infection is reduced. Laboratory studies in patients with LAD will show increased absolute leukocyte counts in the blood, as the leukocytes are unable to maintain their normal marginated position outside of the blood stream against the vessel walls.

Wiskott-Aldrich syndrome (Choice E) is caused by a defective protein involved in interactions between T lymphocytes, antigen-presenting cells, and B lymphocytes, leading to an impaired innate and

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Wiskott-Aldrich syndrome (Choice E) is caused by a defective protein involved in interactions between T lymphocytes, antigen-presenting cells, and B lymphocytes, leading to an impaired innate and adaptive immune system. Patients present with eczema, thrombocytopenia, and infections with encapsulated bacteria and opportunistic pathogens.

Educational Objective: Primary ciliary dyskinesia is a rare congenital disorder characterized by defective cilia and an inability to clear mucus and debris from the airways. Patients typically present with recurrent respiratory infections. Kartagener syndrome is a type of ciliary dyskinesia with the clinical triad of situs inversus, chronic sinusitis, and bronchiectasis.

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26. A physician, who is covering for a colleague who is out of town, receives a telephone call at the office from a dentist regarding whether antibiotic prophylaxis is needed for a scaling procedure for the colleague's patient. The patient is a 50-year-old woman with mitral valve prolapse diagnosed 15 years ago prior to her transferring to the colleague's care. She has never had endocarditis. Further review of the patient's medical record indicates no documentation of echocardiography. She also has hypertension, type 2 diabetes mellitus, and an allergy to penicillin. Medications are lisinopril and metformin. Cardiac examination from the patient's last office visit 6 months ago showed a normal pulse and no murmurs. Which of the following is the most appropriate next step in management of the colleague's patient?

A) Advise the dentist to proceed with the procedure without antibiotic prophylaxis
B) Ask the dentist to postpone the procedure, and then schedule outpatient echocardiography
C) Ask the dentist to postpone the procedure, and then schedule an examination in the office
D) Prescribe amoxicillin to be taken 1 hour before the procedure
E) Prescribe clindamycin to be taken 1 hour before the procedure

Correct Answer: A.

Cardiology societies in the United States and Europe have guidelines recommending the use of antimicrobial prophylaxis during invasive dental procedures for the prevention of bacterial endocarditis in certain situations. Dental procedures that disrupt the mucosal lining of the mouth are known to cause transient bacteremia; however, the risk for subsequent infective endocarditis is less established. The recommendations for antimicrobial prophylaxis are based on the expected risk from a patient's underlying endocardial condition and the degree of potential harm if infective endocarditis does develop. These conditions include the presence of a prosthetic valve, a prior history of infective endocarditis, congenital heart disease, and cardiac transplantation patients with valvulopathy. For an otherwise healthy patient with mitral valve prolapse, the physician should advise the dentist to proceed with the procedure without antibiotic prophylaxis.

Incorrect Answers: B, C, D, and E.

Ask the dentist to postpone the procedure, and then schedule outpatient echocardiography (Choice B) or ask the dentist to postpone the procedure, and then schedule an examination in the office (Choice C) are not necessary for this patient who was seen in the past 6 months and has not developed any new cardiac symptoms.

Prescribe amoxicillin to be taken 1 hour before the procedure (Choice D) is appropriate for patients at highest risk for complications from endocarditis. It is not needed for this patient with stable, asymptomatic mitral valve prolapse and no intracardiac medical devices.

Prescribe clindamycin to be taken 1 hour before the procedure (Choice E) is not recommended for any patient undergoing dental procedures because of the frequency of adverse events and limited proof of benefit.

Educational Objective: Patients undergoing dental procedures that disrupt the mucosal lining of the oral cavity are at increased theoretical risk for developing infective endocarditis. Antibiotic prophylaxis with amoxicillin is recommended for patients with a prosthetic valve, a prior history of infective endocarditis, congenital heart disease, or a cardiac transplantation complicated by valvulopathy.

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27. A 52-year-old woman with amyotrophic lateral sclerosis has been receiving mechanical ventilation in the hospital for the past 4 weeks. She is taking no medications. Attempts at discontinuing mechanical ventilation have been unsuccessful. Her parents visit her often and participate in her health care decisions. The physician tells her and her parents that she could require mechanical ventilation for several more years and recommends transfer to a facility for ventilator-dependent patients. Although her parents approve of this recommendation, the patient refuses placement and asks to have mechanical ventilation and all other life-sustaining treatments withheld. She says, "I would rather die now than spend the rest of my life in one of those places." Which of the following is the most appropriate next step in management?

A) Ask the parents privately about the patient's prior beliefs about long-term care
B) Assess the patient's mental capacity to make her own health care decisions
C) Continue current treatment and start additional treatment as needed
D) Continue current treatment but do not start any new life-sustaining treatment
E) Seek a court order to appoint a guardian to make her health care decisions

Correct Answer: B.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. Capacity assessments are based on a discussion with the patient in order to assess these four factors of understanding, appreciation, reasoning, and choice, and can be conducted by any physician. Capacity is not a global assessment but rather pertains to a specific decision, and therefore the assessment should be based on the individual patient, their condition at the time, and the particular medical decision being made. The assessment must be performed rigorously in settings where the consequences of the decision are particularly serious, as in this case. This patient with amyotrophic lateral sclerosis has a poor long-term prognosis and is facing end-of-life decision making. Some patients may value quality of life or comfort rather than prolongation of life, and patients have a right to express these values in their decision making. This patient is alert and appears to have decisional capacity. A further assessment of her capacity should be conducted to explore her reasoning and to exclude other factors, such as depression, that may limit her capacity.

Incorrect Answers: A, C, D, and E.

Asking the parents privately about the patient's prior beliefs about long-term care (Choice A) may be helpful for understanding her reasoning but does not supersede her current decision-making capacity.

Continuing current treatment with or without starting additional treatment (Choices C and D) is potentially unethical given that this patient on mechanical ventilation has expressed a desire to discontinue life-sustaining treatments. A capacity assessment should first be performed before further decisions to continue or discontinue treatment are made.

Seeking a court order to appoint a guardian to make her health care decisions (Choice E) is inappropriate and neglects the patient's autonomy. Appointment of a legal guardian can be pursued when a patient is thought to lack decision-making capacity across all domains, which this patient has not demonstrated.

Educational Objective: To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. For patients making end-of-life decisions, a capacity assessment should be performed to explore the patient's reasoning and to exclude other factors, such as depression, that may limit decisional capacity.

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28. A 62-year-old man comes to the physician because of a lesion on his right temple for 3 months. He works as a farmer. Examination shows a 1.5-cm ulcerated lesion over the right temple area; the lesion has a raised margin and a waxy border. If left untreated, which of the following is the most likely sequela of the lesion?

A) Local spread
B) Lymphatic invasion
C) Regression
D) Systemic metastases

Correct Answer: A.

Basal cell carcinoma is the most common form of skin cancer and is derived from the basal cells of the epidermis. The primary risk factor for developing basal cell carcinoma is ultraviolet light exposure, though age, fair skin, and family history are also contributory. Basal cell carcinomas typically present as pink, pearly papules or nodules with rolled borders and central ulceration commonly on sun-exposed areas of the head and neck. Subtypes of basal cell carcinoma include those that are less invasive, such as superficial and nodular, and those that are more invasive, such as infiltrative and morpheaform. In all subtypes, the risk for metastasis is low, although the tumors can invade locally and cause significant tissue damage. Biopsy may be performed with a variety of techniques, including excisional, shave, or punch biopsy. Treatment of basal cell carcinoma requires complete surgical removal, either via excision or Mohs micrographic surgery. In the case of incomplete excision, re-excision with negative biopsy margins is indicated to reduce the risk for further local spread.

Incorrect Answers: B, C, and D.

Lymphatic invasion (Choice B) occurs in particular malignancies, such as cutaneous and oropharyngeal squamous cell carcinoma, but it does not occur in cutaneous basal cell carcinoma.

Regression (Choice C) may occur spontaneously in a variety of cutaneous neoplasms, particularly keratoacanthoma. Keratoacanthoma is characterized by a dome-shaped proliferation of keratinocytes with a central, keratin-filled crater and also typically occurs on sun-exposed areas. While most keratoacanthomas are characterized by a benign course, often undergoing spontaneous involution, some lesions progress to squamous cell carcinoma.

Systemic metastases (Choice D) are typical of cutaneous melanoma, which commonly metastasizes to the liver, lungs, and brain. Basal cell carcinoma does not typically result in systemic metastases.

Educational Objective: Basal cell carcinomas typically present as pink, pearly papules or nodules with rolled borders and central ulceration commonly on sun-exposed areas of the head and neck. Basal cell carcinoma does not tend to metastasize but can spread locally. Treatment of basal cell carcinoma requires complete surgical removal, either via excision or Mohs micrographic surgery.

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29. A 57-year-old man comes to the emergency department because of a 6-hour history of fatigue and mild shortness of breath. He has type 2 diabetes mellitus, hypertension, and anuric renal failure requiring hemodialysis. He reports having missed his regularly scheduled dialysis session 2 days ago. His current medications are enalapril, amlodipine, insulin, calcitriol, and calcium supplementation. His temperature is 37°C (98.6°F), pulse is 110/min, respirations are 24/min, and blood pressure is 160/100 mm Hg. Examination shows no jugular venous distention. Crackles are heard at both lung bases. Heart sounds are normal. Serum studies show a potassium concentration of 6.8 mEq/L, urea nitrogen concentration of 120 mg/dL, and creatinine concentration of 9.9 mg/dL. An ECG shows sinus tachycardia at 115/min, with widening of the PR and QRS intervals and peaked T waves. Intravenous administration of which of the following is the most appropriate next step in treatment?

A) Atenolol
B) Calcium chloride
C) Furosemide
D) Lidocaine
E) Magnesium sulfate
F) 0.9% Saline

Correct Answer: B.

This patient's presentation is consistent with hyperkalemia in the setting of end-stage kidney disease, with resultant cardiac membrane irritability as evidenced by ECG findings consistent with hyperkalemia. The patient requires immediate intervention to reduce the risk for a fatal arrhythmia. ECG evidence of hyperkalemia includes flattening of the P-waves, lengthening of the PR interval, widening of the QRS complex, and the presence of tall, peaked T waves. Acute management in order of priority involves stabilization of the myocardium with calcium gluconate or calcium chloride, shifting serum potassium into the intracellular compartment (using insulin and dextrose, sodium bicarbonate, beta-2 adrenergic agonists), and removal of potassium from the body (using diuretics, oral potassium binders, hemodialysis). After the patient is stabilized, evaluation should be directed to identifying the cause of the hyperkalemia. In this patient, the most likely explanation of hyperkalemia is missing dialysis with underlying end-stage kidney disease. Next steps include laboratory studies, urgent hemodialysis, and admission for further management.

Incorrect Answers: A, C, D, E, and F.

Atenolol (Choice A) is a β1-selective antagonist with greater activity at β1 receptors than β2 receptors. It is used in the treatment of hypertension, arrhythmias, and heart failure. This patient's hypertension and pulmonary edema is caused by volume overload secondary to missed dialysis, less likely caused by heart failure or hypertensive emergency.

Furosemide (Choice C) may be trialed in this patient in combination with intravenous fluids to decrease the total body potassium concentration by blocking absorption of potassium in the loop of Henle. Calcium chloride or gluconate and attempts to shift potassium into the intracellular compartment should be initiated first. The presence of anuria may limit any application of furosemide in this case, and acute hemodialysis will likely be required.

Lidocaine (Choice D) is a class Ib antiarrhythmic and local anesthetic that inhibits sodium channels. It can be used intravenously to treat ventricular tachyarrhythmias or subcutaneously to provide local anesthetic for minor surgical procedures. It does not have a role in treating hyperkalemia.

Magnesium sulfate (Choice E) is used intravenously in the management of torsades de pointes. It inhibits calcium influx into myocardial cells, shortens the QT interval, and decreases the frequency of early afterdepolarizations that propagate the arrhythmia. This patient's ECG changes are secondary to hyperkalemia, not torsades de pointes.

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0.9% saline (Choice F) is unlikely to have a beneficial role in an anuric patient with end-stage kidney disease and signs of hypervolemia. It would not take the place of immediate stabilization of the cardiac membrane with calcium.

Educational Objective: Hyperkalemia presents a risk for fatal arrhythmias, and immediate treatment is required. The initial step is stabilization of the myocardium using intravenous calcium formulations (eg, calcium gluconate, calcium chloride), followed by attempts to shift potassium into the intracellular compartment, remove potassium from the body, and address the underlying cause.

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30. A 13-year-old boy is brought to the physician because of intermittent pain in his right thigh during the past 6 weeks. The symptoms are exacerbated by running, and his mother reports that he limps for 30 minutes after running. He has no history of serious illness and takes no medications. He recalls no recent trauma to either leg. He has practiced with the school football team three times weekly for the past 2 months. He is at the 75th percentile for height and 95th percentile for weight and BMI. Examination shows a normal gait. There is no tenderness of the right hip or thigh. Internal rotation of the right hip is difficult, especially when the knee is flexed. Genital and pubic hair development are sexual maturity rating (SMR) stage 3. An x-ray of the hips is shown. Which of the following is the most appropriate treatment?

A) Physical therapy
B) Nonsteroidal anti-inflammatory drug therapy
C) Cast immobilization of the right hip and thigh
D) Surgical stabilization of the femoral head
E) No treatment is indicated

Correct Answer: D.

Slipped capital femoral epiphysis (SCFE) most commonly occurs in children between the ages of 10 to 15 years who are overweight. SCFE is a displacement of the femoral epiphysis relative to the femoral neck secondary to anterosuperior movement of the metaphysis. It is a Salter-Harris type 1 fracture of the growth plate. SCFE typically presents with a painful limp and, if severe, may result in restricted range of motion of the hip joint (eg, limited abduction and internal rotation of the hip as in this case) and inability to bear weight on the affected lower extremity. Pain often refers to the knee and thigh. X-ray evaluation of both hips in frontal and frog-leg views permits side-by-side comparison to diagnose the condition. If untreated, complications include avascular necrosis of the femoral head, limited range of motion and gait impairment, and premature osteoarthritis. To prevent these complications, treatment requires surgical stabilization of the femoral head.

Incorrect Answers: A, B, C, and E.

Physical therapy (Choice A) and nonsteroidal anti-inflammatory drug therapy (Choice B) would be appropriate for conditions such as osteoarthritis, a noninflammatory arthropathy that occurs secondary to deterioration of articular cartilage. It typically occurs in older patients and may affect any joint.

Cast immobilization of the right hip and thigh (Choice C) would be indicated in nonsurgical fractures, which are uncommon. A hip spica cast may be appropriate in cases of hip dysplasia or certain fractures of the hip or pelvis. It is not a commonly accepted modality in the management of SCFE.

No treatment (Choice E) would be inappropriate, as SCFE requires surgical fixation.

Educational Objective: Slipped capital femoral epiphysis presents with hip, thigh, and knee pain with limited range of motion and an antalgic gait, generally in a child or teenager who is overweight. It is a

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He is at the 75th percentile for height and 95th percentile for weight and BMI. Examination shows a normal gait. There is no tenderness of the right hip or thigh. Internal rotation of the right hip is difficult, especially when the knee is flexed. Genital and pubic hair development are sexual maturity rating (SMR) stage 3. An x-ray of the hips is shown. Which of the following is the most appropriate treatment?

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Educational Objective: Slipped capital femoral epiphysis presents with hip, thigh, and knee pain with limited range of motion and an antalgic gait, generally in a child or teenager who is overweight. It is a Salter-Harris type 1 fracture of the physis, and treatment requires surgical stabilization of the femoral head.

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31. An 87-year-old woman with type 2 diabetes mellitus comes to the physician for evaluation of a nonhealing foot ulcer that has increasingly worse tissue necrosis and erythema. She has a 2-year history of mild to moderate dementia, Alzheimer type, with no recent changes in cognitive status. The patient lives alone with the help of various neighbors. Her only family is an out-of-town sister, with whom she last spoke 1 year ago. Physical examination shows a 2-cm ulcer that exposes the head of the first metatarsal. There is 1 cm of necrosis and 2 cm of erythema around the edge of the ulcer. On mental status examination, the patient is alert and oriented to person and place but thinks that the year is 1999. She recalls one of three objects after 5 minutes. A below-the-knee amputation is recommended. The risks and benefits of the operation are discussed with the patient. She understands and repeats the discussion correctly. Attempts to contact her sister are unsuccessful. Which of the following is the most appropriate next step in management?

A) Consult with the hospital attorney
B) Delay the amputation until her sister can be contacted
C) Obtain a psychiatric assessment of this patient's mental capacity
D) Schedule a follow-up examination after 1 month of antibiotic therapy
E) Proceed with the amputation

Correct Answer: E.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. Although she displays evidence of mild to moderate dementia, this patient appears to meet the criteria of decisional capacity. Capacity assessments should be based on the individual patient and the particular medical decision being made. While patients with dementia may have impairment of their cognitive abilities, it should not be assumed that such patients lack capacity, as many are still able to appreciate risks, conduct reasoning, and express choice.

Incorrect Answers: A, B, C, and D.

Consulting with the hospital attorney (Choice A) is not necessary, as this patient possesses capacity to make this particular decision about her medical care. Similarly, delaying the amputation until her sister can be contacted (Choice B) would be correct if the patient lacked capacity; however, in this case, it appears she is able to comprehend and reason through the decision to have the surgery. In cases of advanced dementia, though, it may be appropriate to identify a surrogate decision maker.

Obtaining a psychiatric assessment of this patient's mental capacity (Choice C) is unnecessary. Mental capacity differs from decision-making capacity. Decision-making capacity assessments are based on a discussion with the patient in order to assess understanding, appreciation, reasoning, and choice, and can be conducted by any physician.

Scheduling a follow-up examination after 1 month of antibiotic therapy (Choice D) is inappropriate. While it is appropriate to attempt to restore capacity in situations where the patient is thought to temporarily lack capacity, such as in the setting of delirium, it is not appropriate to delay necessary care for prolonged periods of time.

Educational Objective: Capacity assessments should be based on the individual patient and the particular medical decision being made. They are based on a discussion with the patient in order to assess understanding, appreciation, reasoning, and choice. While patients with dementia may have impairment of their cognitive abilities, it should not be assumed that such patients lack capacity.

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32. A 47-year-old woman comes to the physician because of a 2-month history of substernal chest tightness and shortness of breath associated with exercise and relieved by rest. She previously walked 2 miles daily, but now she is limited to walking one-half block because of chest pain, dyspnea, and light-headedness. She has never smoked and drinks one to two beers daily. Her temperature is 36.8°C (98.2°F), pulse is 98/min, respirations are 20/min, and blood pressure is 110/82 mm Hg. Jugular venous pressure is 8 cm H_2O. Crackles are heard at both lung bases. The point of maximal impulse is increased but not displaced; S_1 is normal, but S_2 is decreased. There is a grade 3/6, harsh systolic murmur at the cardiac base. Serum studies show a total cholesterol concentration of 210 mg/dL, HDL-cholesterol concentration of 95 mg/dL, and LDL-cholesterol concentration of 100 mg/dL. Which of the following is the most likely cause of this patient's heart failure?

A) Alcohol use disorder
B) Amyloidosis
C) Anemia
D) Aortic stenosis
E) Atrial fibrillation
F) Cor pulmonale
G) Hemochromatosis
H) Ischemic heart disease
I) Mitral regurgitation

Correct Answer: D.

The presence of a harsh, systolic murmur and a decreased S_2 heart sound suggests that aortic stenosis is the cause of this patient's symptoms. Many people will develop some degree of valve stenosis in their lifetime as a result of chronic inflammation with resultant calcification and fibrosis over time, with the aortic valve most commonly affected. Early onset aortic stenosis (ages 40 to 60 years), as in this patient, can occur in the setting of a congenital bicuspid valve or chronic rheumatic heart disease. Patients may complain of fatigue, shortness of breath, cough, diminished exercise tolerance, chest pain, or syncope with exertion. Examination findings include a crescendo-decrescendo systolic murmur best heard at the upper right sternal border. Pulsus parvus et tardus (weak and delayed) may be noted on examination of peripheral pulses. A diminished S_2 heart sound results from weakened closing of the valve. Severe aortic stenosis can lead to left ventricular hypertrophy and heart failure over time.

Incorrect Answers: A, B, C, E, F, G, H, and I.

Alcohol use disorder (Choice A) causes hypertension, which can contribute to heart failure, and some patients may develop dilated cardiomyopathy from direct toxic effects to cardiomyocytes. These complications are associated with heavier alcohol use patterns than this patient has reported, and her physical examination findings are more consistent with aortic stenosis.

Amyloidosis (Choice B), in which proteins deposit in tissues and cause organ dysfunction, can cause restrictive cardiomyopathy. Amyloidosis is commonly associated with plasma cell dyscrasias such as multiple myeloma, and chronic inflammatory conditions such as rheumatoid arthritis, systemic lupus erythematosus, and inflammatory bowel disease. It is uncommon compared with aortic stenosis and is unlikely in this patient.

Anemia (Choice C), if severe, can cause a loud systolic flow murmur best heard at the apex. Other conditions that cause a similar murmur include fever, pregnancy, and hyperthyroidism. Tachycardia would be expected.

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Correct Answer: D.

The presence of a harsh, systolic murmur and a decreased S_2 heart sound suggests that aortic stenosis is the cause of this patient's symptoms. Many people will develop some degree of valve stenosis in their lifetime as a result of chronic inflammation with resultant calcification and fibrosis over time, with the aortic valve most commonly affected. Early onset aortic stenosis (ages 40 to 60 years), as in this patient, can occur in the setting of a congenital bicuspid valve or chronic rheumatic heart disease. Patients may complain of fatigue, shortness of breath, cough, diminished exercise tolerance, chest pain, or syncope with exertion. Examination findings include a crescendo-decrescendo systolic murmur best heard at the upper right sternal border. Pulsus parvus et tardus (weak and delayed) may be noted on examination of peripheral pulses. A diminished S_2 heart sound results from weakened closing of the valve. Severe aortic stenosis can lead to left ventricular hypertrophy and heart failure over time.

Incorrect Answers: A, B, C, E, F, G, H, and I.

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Anemia (Choice C), if severe, can cause a loud systolic flow murmur best heard at the apex. Other conditions that cause a similar murmur include fever, pregnancy, and hyperthyroidism. Tachycardia would be expected.

Atrial fibrillation (Choice E) with rapid ventricular response presents with episodic tachycardia, heart palpitations, shortness of breath, dizziness, and anxiety. Patients will have an irregularly irregular pulse, and, typically, heart rates greater than 100 beats per minute.

Cor pulmonale (Choice F) describes right-sided heart failure secondary to chronic lung pathology. Chronic lung disease is associated with pulmonary hypertension, and, similar to systemic hypertension causing left-sided heart failure, over time the right side of the heart fails as a result of the increased demands of pumping against elevated pulmonary arterial resistance. This patient has no history of pulmonary disease.

Hemochromatosis (Choice G) presents with liver failure, diabetes mellitus, arthritis, heart failure, darkening of the skin, and gonadal atrophy secondary to excess total body iron. It is typically diagnosed in men over the age of 40.

Ischemic heart disease (Choice H) would be unexpected in a young, premenopausal patient with no family history of cardiac disease.

Mitral regurgitation (Choice I) presents with a holosystolic murmur best heard in the fourth or fifth left intercostal space along the midclavicular line and radiates to the left axilla. It is commonly associated with mitral valve prolapse, acute rheumatic fever, endocarditis, and prior myocardial infarction.

Educational Objective: Aortic stenosis is common and typically presents with a crescendo-decrescendo systolic murmur best heard at the upper right sternal border. It classically occurs secondary to age-related fibrotic and calcific changes of the valve but can occur earlier in life in cases of bicuspid aortic valve or chronic rheumatic heart disease.

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33. A 30-year-old man who is in the US Army is brought to the emergency department of a military hospital 40 minutes after being hit by a motor vehicle traveling 25 mph while he was walking. On arrival, he is unconscious. Temperature is 36.0°C (96.8°F), pulse is 113/min, respirations are 22/min, and blood pressure is 80/55 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. On examination, the abdomen is rigid. He is resuscitated with 8 units of packed red blood cells, 6 units of fresh frozen plasma, and 2 units of platelets. Emergency laparotomy shows transection of the small bowel 5 cm proximal to the cecum. Laboratory studies done 45 minutes after arriving in the surgical intensive care unit show an activated partial thromboplastin time of 42 seconds and a prothrombin time of 25 seconds (INR=3.2). Which of the following is the most likely cause of the coagulation abnormalities in this patient?

A) Cirrhosis
B) Disseminated intravascular coagulation
C) Factor VII deficiency
D) Hyperfibrinogenemia
E) Thrombocytopenia

Correct Answer: B.

Disseminated intravascular coagulation (DIC) is a systemic disorder characterized by the widespread activation of the clotting cascade resulting in microthrombi formation, thrombocytopenia, and bleeding complications caused by consumption of platelets and clotting factors. Causes of DIC are many, including trauma, sepsis, malignancy, pancreatitis, and exposure to toxins. Regardless of underlying cause, the clinical effects include stigmata of bleeding (petechiae, purpura, oozing at surgical and venipuncture sites, clinical evidence of bleeding), and laboratory abnormalities reflecting disseminated activation of the clotting cascade (increased activated partial thromboplastin time, prothrombin time, and INR) and consumption of platelets (thrombocytopenia). Additional laboratory abnormalities include increased D-dimer, caused by the presence of fibrin split products, and decreased fibrinogen concentration, along with increased markers of hemolysis (detectable free hemoglobin, decreased haptoglobin, increased lactate dehydrogenase). Intravascular fibrin strands and microthrombi cause shearing of erythrocytes, leading to microangiopathic hemolytic anemia. Treatment includes correcting the underlying cause and resulting coagulopathy and thrombocytopenia.

Incorrect Answers: A, C, D, and E.

Cirrhosis (Choice A) can cause bleeding and impaired coagulation. It also presents with stigmata of liver failure including ascites, increased bilirubin, jaundice, and signs of portal hypertension, such as esophageal varices, splenomegaly, caput medusae, and rectal varices. It typically occurs in patients with preceding conditions such as alcohol abuse or chronic hepatitis.

Factor VII deficiency (Choice C) is a rare bleeding disorder with a spectrum of clinical severity. Patients who are most affected present with heavy menstrual bleeding or bleeding following invasive procedures. Treatment is with factor replacement, prothrombin complex concentrate, or frozen plasma.

Hyperfibrinogenemia (Choice D) promotes thrombosis by enhancing fibrin formation and stability. It leads to increased coagulation. DIC leads to decreased fibrinogen concentrations, whereas hyperfibrinogenemia presents with increased fibrinogen. Unless inadvertently identified in the setting of traumatic injury, DIC is a more likely cause given the temporal correlation with trauma and intraabdominal injury, and consistent laboratory studies.

Thrombocytopenia (Choice E) refers to abnormally decreased platelet count and may present with bleeding as a result of an insufficient quantity of platelets. Bleeding, if it occurs, tends to be mucocutaneous. Symptoms can include abnormal bleeding or bruising, often presenting with petechiae, ecchymoses, and mucosal bleeding (eg, menorrhagia, epistaxis), along with persistent oozing at puncture and operative sites. The prothrombin time and partial thromboplastin time would be normal.

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C) Factor VII deficiency
D) Hyperfibrinogenemia
E) Thrombocytopenia

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Educational Objective: Disseminated intravascular coagulation can be provoked by numerous causes, including trauma, sepsis, malignancy, pancreatitis, and exposure to toxins. It is characterized by depletion of coagulation factors, microangiopathic hemolytic anemia, thrombocytopenia, and bleeding.

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34. A 25-year-old woman, gravida 1, para 1, comes to the office because of a 3-month history of chronic moderate perianal pain and bleeding that began 3 days after she gave birth via cesarean delivery. Before the onset of her symptoms, she had constipation associated with the use of postdelivery oxycodone therapy. The constipation resolved after she discontinued the medication, but her bowel movements have been painful and she has noticed blood on the toilet tissue. One week ago, the patient's obstetrician prescribed topical hydrocortisone and diltiazem, which provide temporary relief but do not resolve her symptoms. The patient's medical history otherwise is unremarkable and she takes no other medications. Family history is unremarkable. Vital signs are temperature 37.2°C (99.0°F), pulse 80/min, respirations 20/min, and blood pressure 130/80 mm Hg. Examination of the anus shows a deep wound in the posterior midline with exposure of the internal sphincter muscle and an associated 1.5-cm skin tag. Which of the following is the most appropriate next step in management?

A) Biopsy of the wound
B) Colonoscopy
C) Metronidazole therapy
D) Surgical repair

Correct Answer: D.

Anal fissures commonly present with rectal pain, particularly with defecation, and bleeding caused by a tear in anal tissue, most commonly at the posterior midline. This tear in the mucosa may expose the internal anal sphincter and may be associated with local skin tags. Pain can occur from irritation of the tear itself or a spasm of the internal sphincter, the latter of which can cause ischemia and prevent healing. Causes of primary anal fissures include constipation, diarrhea, and vaginal delivery, although secondary fissures can occur in the setting of systemic illnesses such as sarcoidosis, inflammatory bowel disease, or HIV infection. Initial management of anal fissures includes the prevention or treatment of constipation, topical analgesics, and topical vasodilators. However, these methods are typically ineffective for chronic anal fissures, which are present for longer than 8 weeks. Chronic fissures, or those that are unresponsive to conservative management, should undergo surgical repair.

Incorrect Answers: A, B, and C.

Biopsy of the wound (Choice A) is not necessary and may exacerbate this patient's pain. She has the classic signs and symptoms of an anal fissure, with the fissure being evident on physical examination. As her symptoms have not responded to conservative medical management, she should undergo surgical repair.

Colonoscopy (Choice B) is used to evaluate the rectum and colon and is commonly used for cancer screening or inflammatory bowel disease diagnosis. This patient's symptoms are related to an external anal injury. Anal fissures are not frequently related to internal disorders in the absence of other symptoms, so colonoscopy is not necessary.

Metronidazole therapy (Choice C) is used in the treatment of anaerobic infections, such as intra-abdominal abscesses. It is occasionally used in the treatment of sexually transmitted infections. This patient has clear evidence of an anal fissure on examination and no clear signs of infection that would warrant metronidazole therapy.

Educational Objective: Anal fissures commonly present with rectal pain and bleeding with defecation caused by local trauma that causes a tear in the anal tissue, most commonly in the posterior midline. Significant pain occurs as a result of irritation to the tear itself or a spasm of the internal sphincter. Management includes the prevention or treatment of constipation, topical analgesics, and topical vasodilators. Chronic fissures, or those that are unresponsive to conservative management, require surgical repair.

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35. A 42-year-old man is brought to the emergency department by paramedics 1 hour after his girlfriend found him confused and agitated in his home. The girlfriend says that when she spoke with him on the telephone last night, she noted no problems, but she became worried when he did not answer his telephone 3 hours ago. He has a 3-year history of chronic back pain for which he takes oxycodone. He also has major depressive disorder and seasonal allergies treated with citalopram and diphenhydramine, respectively. On arrival, he is confused, screaming loudly, and actively pulling against wrist restraints. His temperature is 38°C (100.4°F), pulse is 163/min, respirations are 24/min, and blood pressure is 215/105 mm Hg. Physical examination shows diaphoresis and tremulousness. The pupils are dilated. Which of the following is the most likely cause of this patient's confusion?

A) Acetaminophen overdose
B) Cannabis withdrawal
C) Cocaine intoxication
D) Diphenhydramine toxicity
E) Opioid withdrawal

Correct Answer: C.

Cocaine blocks the presynaptic reuptake of dopamine, serotonin, and norepinephrine, which increases the concentration of these substances in the synaptic cleft. Cocaine is an addictive recreational drug that typically causes euphoria, restlessness, and increased sympathetic tone (ie, tachycardia, hypertension, pupillary dilation). Increased synaptic dopamine leads to addiction (and in severe cases, hallucinations and paranoia). Increased synaptic serotonin leads to euphoria, while increased synaptic norepinephrine can cause tachycardia and hypertension through activation of sympathetic adrenoreceptors leading to increased cardiac chronotropy and peripheral vasoconstriction. Further, cocaine can act as a local anesthetic by decreasing sodium channel permeability and thereby slowing or blocking pain signal conduction.

Incorrect Answers: A, B, D, and E.

Acetaminophen overdose (Choice A) presents with nonspecific symptoms of fatigue, malaise, and abdominal pain followed by signs and symptoms of liver failure, including jaundice, altered mental status, and coagulopathy.

Cannabis withdrawal (Choice B) is characterized by irritability, anxiety, depression, insomnia, restlessness, and decreased appetite.

Diphenhydramine toxicity (Choice D) can lead to central nervous system H1-receptor blockade, anticholinergic, and anti-α-adrenergic adverse effects. This results in a constellation of symptoms such as dry mouth, urinary retention, constipation, hallucinations, delirium, ataxia, flushed skin, visual disturbances (eg, cycloplegia), and sedation.

Opioid withdrawal (Choice E) causes restlessness, tachycardia, hypertension, tremors, nausea, and vomiting, as well as lacrimation, rhinorrhea, piloerection, and yawning.

Educational Objective: Cocaine is a central nervous system stimulant that causes euphoria and increases sympathetic tone, leading to tachycardia, hypertension, pupillary dilation, and restlessness. As a result of increased synaptic dopamine, hallucinations and paranoia can occur.

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36. A 21-year-old woman, gravida 2, para 1, at 36 weeks' gestation is admitted to the hospital in labor. She received no prenatal care. She has no history of operative procedures. She reports that she occasionally used cocaine before she knew she was pregnant but has abstained from illicit drug use during the past 8 months. On admission, the cervix is 5 cm dilated and 100% effaced; the vertex is at 0 station. There is a moderate amount of blood-tinged mucus. The membranes are artificially ruptured, yielding clear fluid. Her blood group is A, Rh-negative; a serum anti-D antibody titer is positive. During the next 30 minutes, fetal heart monitoring shows regular, sinusoidal wave forms. Which of the following is the most likely cause of this fetal heart rate pattern?

A) Abruptio placentae
B) Fetal heart defect
C) Maternal cocaine use
D) Placenta previa
E) Rh isoimmunization

Correct Answer: E.

Rh(D)-negative mothers are at a high risk for developing anti-Rh(D) antibodies, referred to as Rh isoimmunization, if exposed to blood from a Rh(D)-positive fetus. While this commonly occurs at delivery, it can also occur prior to delivery with vaginal bleeding or procedures such as amniocentesis. If Rh(D) antigens from the fetal circulation enter the maternal circulation, it is possible that the mother's immune system will form antibodies against the Rh(D) antigen. This can result in hemolytic anemia of the fetus (erythroblastosis fetalis), especially with subsequent pregnancies, as the mother's antibodies may cross the placenta and cause hemolysis of fetal red blood cells. Rh(D) immune globulin (RhoGAM) acts by binding to Rh(D)-positive cells that enter the maternal circulation, preventing the immune system from developing antibodies to the Rh(D) antigen. It is commonly given to Rh(D)-negative mothers at 28 weeks' gestation. The sinusoidal pattern on fetal heart rate monitoring is indicative of anemia of the fetus, likely secondary to hemolysis in the setting of Rh isoimmunization.

Incorrect Answers: A, B, C, and D.

Abruptio placentae (Choice A) is the premature separation of the placenta from the uterus. It commonly presents with vaginal bleeding, severe uterine pain, and tetanic contractions, typically in the third trimester. While cocaine toxicity is a risk factor for placental abruption, this patient has not used cocaine in 8 months. Given her blood group and lack of prenatal care, Rh isoimmunization is a more likely cause of the sinusoidal pattern on fetal heart rate monitoring.

Fetal heart defect (Choice B) can include a variety of pathologies, such as ventricular septal defects and Tetralogy of Fallot. They are often diagnosed on prenatal ultrasonography. While these defects may be associated with cardiac arrhythmias, they are unlikely to cause the sinusoidal pattern seen in this fetus.

Maternal cocaine use (Choice C) can predispose patients to placental abruption which, if severe, can lead to fetal exsanguination and the sinusoidal pattern seen in this fetus. However, placental abruption is more likely to occur during or shortly after use of cocaine or in the setting of trauma. It is associated with severe abdominal pain and vaginal bleeding, which this patient does not show.

Placenta previa (Choice D) occurs when the placenta overlies the cervical os, which presents with painless vaginal bleeding. It is a contraindication to digital cervical examination and vaginal delivery, as these events can cause fetomaternal hemorrhage. This patient has had minimal vaginal bleeding, making placenta previa unlikely.

Educational Objective: A sinusoidal pattern on fetal heart rate monitoring is indicative of anemia of the fetus. One cause of this anemia is Rh isoimmunization of the mother during a prior exposure to the Rh(D) antigen, which can occur during delivery, spontaneous abortion, procedures such as amniocentesis, and other causes of fetomaternal bleeding. Rh(D) immune globulin (RhoGAM) acts by binding to Rh(D)-positive cells that enter the maternal circulation, preventing the immune system from developing antibodies to the Rh(D) antigen. It is commonly given to Rh(D)-negative mothers at 28 weeks' gestation.

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37. A 22-year-old college student comes to the physician because of a 3-year history of falling asleep during her classes; she worries that she will not be able to continue with her education because of this. She says that she always has had difficulty staying awake during class, even in high school. She also occasionally has trouble staying awake during movies. She says she has no problems getting to sleep or waking up. She goes to bed between midnight and 1 AM and gets up at 8 AM. She has tried sleeping for longer durations, even up to 8½ hours, but she still has been unable to stay awake during the day. She has the greatest difficulty staying awake during her classes after lunch. She thinks that she sleeps very soundly and moves little during sleep because her bedsheets are neat when she awakens in the morning. She does not remember having dreams. She reports that no one has ever told her that she snores. She is 170 cm (5 ft 5 in) tall and weighs 62 kg (136 lb); BMI is 21 kg/m^2. Physical examination shows no abnormalities. On mental status examination, she has a concerned mood and a reactive affect. Which of the following is the most appropriate next step in diagnosis?

A) Minnesota Multiphasic Personality Inventory
B) Overnight pulse oximetry
C) Pulmonary function tests
D) MRI of the brain
E) Multiple sleep latency tests

Correct Answer: E.

Narcolepsy is the most likely diagnosis in this patient with daytime somnolence despite restorative sleep and no other features pathognomonic of other sleep disorders. The pathogenesis of narcolepsy involves the loss of orexin-A and orexin-B, which are neurotransmitters found primarily in the hypothalamus that promote wakefulness and inhibit REM sleep. Loss of these neurotransmitters permits abnormal transition from wakefulness to REM sleep. Patients may experience hallucinations, cataplexy, and sleep paralysis. The diagnosis can be made in patients with daytime somnolence and cataplexy, or in cases where cataplexy is not present, with multiple sleep latency tests that show a shorter time from wakefulness to the initiation of REM sleep. Occasionally, patients undergo lumbar puncture to directly measure levels of orexin-A in the cerebrospinal fluid.

Incorrect Answers: A, B, C, and D.

Minnesota Multiphasic Personality Inventory (Choice A) is a test used to evaluate for psychopathology. It may be considered if there is concern for factitious or somatization disorder, but workup for organic sleep disorders should be performed first.

Overnight pulse oximetry (Choice B) is useful in the initial evaluation of sleep apnea. Obstructive sleep apnea is commonly seen in patients with obesity, pharyngeal muscle weakness, or upper airway deformities and often presents with snoring and nighttime apneic episodes. Both obstructive and central sleep apnea present with daytime somnolence. Multiple sleep latency tests will evaluate for these disorders as well as narcolepsy.

Pulmonary function tests (Choice C) are unlikely to provide useful information in this context. Her symptoms are not suggestive of a respiratory disorder.

MRI of the brain (Choice D) may be considered if the diagnostic workup for narcolepsy and other sleep disorders is unrevealing to evaluate for central nervous system lesions that may be causing her symptoms. It is not indicated at this time.

Educational Objective: Narcolepsy should be considered in patients who present with daytime somnolence despite restorative sleep. The disorder is characterized by rapid, abnormal transitions from wakefulness to REM sleep. The diagnosis can be made in patients with daytime somnolence and cataplexy, or in cases where cataplexy is not present, with multiple sleep latency tests that show a shorter time from wakefulness to the initiation of REM sleep.

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38. A 38-year-old woman comes to the office because of a 6-month history of progressive fatigue and muscle weakness. During this time, she has not been able to concentrate at work and has noticed that her voice has become hoarse. During the past 3 months, she has had a 5.4-kg (12-lb) weight gain despite limiting her food intake. She has bipolar disorder, type 2 diabetes mellitus, and hypercholesterolemia. Her medications are metformin, lisinopril, lithium, and pravastatin. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Her temperature is 37°C (98.6°F), pulse is 50/min, respirations are 14/min, and blood pressure is 130/90 mm Hg. Examination shows cold skin and coarse hair over the scalp. There is a firm, nontender, symmetrically enlarged thyroid gland. Deep tendon reflexes are 1+. Her serum thyroid-stimulating hormone concentration is 25 µU/mL. Results of serum electrolyte concentrations and renal function tests are within the reference ranges. Antithyroid peroxidase antibody testing is negative. Which of the following is the most likely cause of these findings?

A) Autoimmune thyroiditis
B) Granulomatous infiltration
C) Iodine deficiency
D) Medication adverse effect
E) Pituitary dysfunction

Correct Answer: D.

Lithium is a mood-stabilizing medication used to treat acute mania and as maintenance treatment in bipolar disorder. At therapeutic doses, lithium can cause a variety of adverse effects, including tremor, nystagmus, nephrogenic diabetes insipidus, and thyroid dysfunction. Lithium-induced thyroid dysfunction occurs in as many as 50% of patients being treated with lithium, usually within 1 to 2 years of beginning treatment. The most common manifestations of lithium-induced thyroid dysfunction are hypothyroidism and goiter, although hyperthyroidism and autoimmune thyroiditis may also occur. The goiter that occurs in lithium-induced thyroid dysfunction is usually diffuse and nonnodular. Patients beginning lithium treatment should undergo baseline thyroid function evaluation. Treatment does not differ from that of thyroid disorders of other causes. It is usually not necessary to discontinue lithium treatment in the setting of thyroid dysfunction.

Incorrect Answers: A, B, C, and E.

Autoimmune thyroiditis (Choice A), also known as chronic lymphocytic (Hashimoto) thyroiditis, is the most common form of thyroiditis and is characterized by the presence of antithyroid peroxidase and antithyroglobulin antibodies. Patients with chronic disease present with signs and symptoms of hypothyroidism, including fatigue, cold intolerance, weight gain, hyporeflexia, myxedema, and dry, cool skin. This patient with negative antithyroid peroxidase antibody testing is more likely to have lithium-induced hypothyroidism.

Granulomatous infiltration (Choice B) is characteristic of subacute granulomatous thyroiditis, also known as subacute (de Quervain) thyroiditis. Subacute granulomatous thyroiditis is a self-limited condition that often follows an acute viral illness and may present with symptoms of hyperthyroidism. A painful, tender thyroid is highly suggestive of this diagnosis.

Iodine deficiency (Choice C) is the cause of endemic goiter. It is rare in developed countries because of the routine fortification of common food staples with iodine, such as salt.

Pituitary dysfunction (Choice E) caused by mass lesions or ischemia may lead to secondary hypothyroidism as a result of inadequate TSH production. This patient has an increased TSH concentration, which is not consistent with secondary hypothyroidism.

Educational Objective: Lithium-induced thyroid dysfunction occurs in as many as 50% of patients being treated with lithium, usually within 1 to 2 years of beginning treatment. The most common manifestations of lithium-induced thyroid dysfunction are hypothyroidism and goiter, although hyperthyroidism and autoimmune thyroiditis may also occur.

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39. A 27-year-old man comes to the emergency department because of a progressive rash and wheezing. Yesterday, the patient received the diagnosis of cellulitis of his right leg, and cephalexin therapy was begun. He has a history of mild, intermittent asthma and eczema. His only other medication is inhaled albuterol as needed. He had a mild allergic reaction to ampicillin as a child. He is in moderate distress. His temperature is 37°C (98.6°F), pulse is 118/min, respirations are 22/min, and blood pressure is 90/60 mm Hg. Examination shows a 3 x 3-cm, erythematous, warm, tender rash on the right leg that is unchanged from yesterday. There are new, raised, 1 x 2-cm pruritic lesions on the upper and lower extremities and trunk. Diffuse, scattered inspiratory and expiratory wheezes are heard bilaterally. Which of the following is the most likely diagnosis?

A) Anaphylactic reaction
B) Rocky Mountain spotted fever
C) Staphylococcal scalded skin syndrome
D) Toxic shock syndrome
E) Urticarial vasculitis

Correct Answer: A.

An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death caused by asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. Patients with a history of atopy, such as asthma and eczema, and a history of medication allergies are at increased risk for anaphylaxis. This patient has a history of ampicillin allergy, asthma, and eczema, and is presenting with symptoms of urticaria, wheezing, tachycardia, and hypotension after initiating a new medication, making an anaphylactic reaction the most likely diagnosis.

Incorrect Answers: B, C, D, and E.

Rocky Mountain spotted fever (Choice B) is a tick-borne illness that is most common in the Southeastern and South Central United States during the spring and summer months. Symptoms occur 2 to 14 days after infection and include fever, headache, malaise, myalgias, arthralgias, as well as an erythematous maculopapular rash that progresses to petechiae. This patient has urticaria and wheezing without a prior tick bite, making anaphylaxis a more likely diagnosis.

Staphylococcal scalded skin syndrome (Choice C), or toxic epidermal necrolysis, occurs as a result of the release of exotoxin from a *Staphylococcus aureus* infection. It most commonly presents in children and immunosuppressed adults with a diffuse erythematous rash that progresses to desquamation, associated with fever and malaise. While this patient's cellulitis may be caused by a staphylococcal skin infection, his symptoms are otherwise not characteristic for scalded skin syndrome.

Toxic shock syndrome (Choice D) occurs as a result of the release of exotoxin from a *Staphylococcus aureus* infection, which leads to the release of cytokines throughout the body. It commonly presents with fever, diffuse macular erythroderma that progresses to desquamation, and hypotension. It is most often associated with women who leave menstrual tampons in place for an extended period of time. It does not cause urticaria or wheezing, and therefore, anaphylaxis is a more likely diagnosis in this patient.

Urticarial vasculitis (Choice E) is a rare vasculitis of the small cutaneous vessels that presents with urticaria, as well as a variety of systemic symptoms, such as arthralgias, abdominal pain, proteinuria, hematuria, cough, hemoptysis, and uveitis. It is more prevalent in women and commonly occurs later in life. It is less likely the cause of this patient's urticaria than anaphylaxis.

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B) Rocky Mountain spotted fever
C) Staphylococcal scalded skin syndrome
D) Toxic shock syndrome
E) Urticarial vasculitis

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An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death caused by asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. Patients with a history of atopy, such as asthma and eczema, and a history of medication allergies are at increased risk for anaphylaxis. This patient has a history of ampicillin allergy, asthma, and eczema, and is presenting with symptoms of urticaria, wheezing, tachycardia, and hypotension after initiating a new medication, making an anaphylactic reaction the most likely diagnosis.

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Urticarial vasculitis (Choice E) is a rare vasculitis of the small cutaneous vessels that presents with urticaria, as well as a variety of systemic symptoms, such as arthralgias, abdominal pain, proteinuria, hematuria, cough, hemoptysis, and uveitis. It is more prevalent in women and commonly occurs later in life. It is less likely the cause of this patient's urticaria than anaphylaxis.

Educational Objective: Anaphylaxis is an IgE-mediated hypersensitivity reaction that leads to extensive degranulation of mast cells and basophils, which results in acute multisystem inflammation and vasodilation. Symptoms include bronchospasm with associated dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. Treatment includes epinephrine, antihistamines, bronchodilators, glucocorticoids, and fluids.

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✓ 40. A 37-year-old man comes to the physician because he has had two bowel movements containing bright red blood during the past 6 hours. He has a 3-day history of intermittent severe abdominal cramps and diarrhea. He has had five loose stools daily during this period. He has no history of serious illness and takes no medications. His last visit to a physician was 5 years ago. His most recent travel experience was a trip to Canada 6 months ago. His temperature is 37°C (98.6°F), pulse is 98/min, and blood pressure is 126/78 mm Hg. Abdominal examination shows diffuse severe tenderness with no peritoneal signs. Bowel sounds are increased. Rectal examination shows no abnormalities. There is no stool in the rectal vault. His hemoglobin concentration is 13 g/dL, leukocyte count is 12,300/mm^3, and platelet count is 302,000/mm^3. Which of the following is the most likely causal organism?

A) *Clostridium difficile*
B) *Clostridium perfringens*
C) *Cryptosporidium parvum*
D) Enterotoxigenic *Escherichia coli*
E) *Escherichia coli* O157:H7

Correct Answer: E.

This patient is presenting with generalized abdominal cramping and diarrhea, likely caused by a viral, bacterial, or parasitic enteritis. *Escherichia coli* O157:H7 is a bacterium that often causes hemorrhagic diarrhea. It is differentiated from other strains of *E. coli* because it produces a Shiga toxin that damages the intestinal wall, which causes hemorrhagic enteritis manifesting as bloody diarrhea. It is also known as enterohemorrhagic *E. coli* infection. Hemolytic uremic syndrome is a complication often triggered by infection with Shiga toxin-producing *E. coli* O157:H7. It typically presents with the triad of hemolytic anemia, thrombocytopenia, and acute kidney injury. Treatment for uncomplicated cases is supportive with oral or intravenous hydration. Antibiotics may be required in severe cases.

Incorrect Answers: A, B, C, and D.

Clostridium difficile (Choice A) infection is an opportunistic and often hospital-acquired infection that commonly occurs after the use of antibiotics caused by the loss of native colonic microbiota that allows competition-free proliferation of *C. difficile*. Patients typically present with watery diarrhea and abdominal pain.

Clostridium perfringens (Choice B) can result in myonecrosis (gas gangrene) following traumatic injury. Its spores can also survive in undercooked food, and, if ingested, can result in food poisoning. It would not typically cause bloody diarrhea.

Cryptosporidium parvum (Choice C) is a parasitic infection that causes cryptosporidiosis, which is characterized by watery diarrhea. It does not typically cause bloody diarrhea and more commonly affects immunocompromised hosts.

Enterotoxigenic *Escherichia coli* (Choice D) is a strain of *E. coli* that causes watery, not bloody, diarrhea.

Educational Objective: *Escherichia coli* O157:H7 is a bacterium that produces a Shiga toxin, which damages the intestinal wall, leading to bloody diarrhea. Complications include hemolytic uremic syndrome.

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41. A 50-year-old man with a 30-year history of paranoid schizophrenia is admitted to a psychiatric facility because of an exacerbation of his condition. His history includes multiple admissions to the hospital for his condition. The physician prescribes oral antipsychotic therapy and the patient agrees to take the medication while in the facility, but he says that he does not need it and he will stop taking the medication as soon as he is discharged. He states, "I don't trust any of you. You're all out to get me. But I'll play along until my time here is done." Which of the following is the most appropriate next step in management?

A) Administer the antipsychotic therapy until the patient's paranoia completely resolves

B) Change the oral antipsychotic therapy to a long-acting injectable formulation

C) Commit the patient to the facility against his will

D) Discharge the patient with support from the local community mental health center, telling him that he can always return to the facility if he needs help in the future

E) Maximize the dose of the antipsychotic therapy until the patient gains insight into his illness

Correct Answer: B.

Nonadherence is a common challenge in patients with schizophrenia. Most antipsychotic agents are dosed with daily oral dosing, which creates a risk for undertreatment, relapse, and potential hospitalization or death in patients who self-discontinue therapy. Long-acting injectable (LAI) antipsychotics provide a useful method of sustaining treatment and reducing relapse and hospitalization in patients with high risk for or known history of nonadherence. A variety of dosing regimens may be used. Available LAI antipsychotics include both first-generation antipsychotics, such as haloperidol, and atypical antipsychotics, such as aripiprazole, olanzapine, paliperidone, or risperidone. The adverse effect profiles of LAI antipsychotics are typically similar to their oral equivalents. Selection of an LAI antipsychotic is based on history of prior treatment response and medication adverse effect profiles.

Incorrect Answers: A, C, D, and E.

Administering the antipsychotic therapy until the patient's paranoia completely resolves (Choice A) is incorrect. This patient has a known history of multiple hospitalizations and remains at high risk for relapse following discharge from the hospital even if his symptoms are well-controlled at that time.

Committing the patient to the facility against his will (Choice C) is incorrect. The patient has currently consented to treatment but has stated an intention not to adhere following discharge. Indefinite commitment to the facility is not an effective solution to nonadherence.

Discharging the patient with support from the local community mental health center, telling him that he can always return to the facility if he needs help in the future (Choice D) is incorrect. Many patients with psychotic disorders experience a cycle of hospitalization and relapse that is exacerbated by nonadherence, unstable living conditions, and frequent concomitant drug abuse. LAI antipsychotics are a better option to help this patient break the cycle of hospitalization that he has previously experienced.

Maximizing the dose of the antipsychotic therapy until the patient gains insight into his illness (Choice E) is incorrect. Many antipsychotics have adverse effects, including extrapyramidal effects, tardive dyskinesia, and metabolic acidosis. Higher oral doses may exacerbate adverse effects and contribute to medication nonadherence.

Educational Objective: Long-acting injectable (LAI) antipsychotics provide a useful method of sustaining treatment and reducing relapse and hospitalization in patients with a high risk or known history of nonadherence. Both first-generation and atypical antipsychotics are available in LAI formulations.

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42. An 8-year-old boy is brought to the emergency department because of a 2-day history of urinary urgency and frequency and right-sided abdominal cramps. The cramps are intermittent, and he cannot get comfortable in any position when they occur. He has not had fever, diarrhea, or constipation, but he has vomited twice. He has no history of similar episodes or serious illness. He takes no medications. His paternal uncle has a history of renal calculi, and his cousin has Crohn disease. The patient has no dietary restrictions. His temperature is 37.5°C (99.5°F). The right flank is tender to palpation. An abdominal x-ray shows a 3-mm ovoid, opaque mass in the right pelvis. Laboratory studies show:

Serum	
Urea nitrogen	20 mg/dL
Creatinine	0.1 mg/dL
Urine	
pH	6.5
RBC	30–50/hpf
WBC	3–5/hpf

In addition to administration of morphine, which of the following is the most appropriate next step in management?

A) Oral administration of allopurinol
B) Oral administration of fluids
C) Oral administration of hydrochlorothiazide
D) Oral administration of potassium citrate
E) Oral administration of pyridoxine
F) Lithotripsy

Correct Answer: B.

Nephrolithiasis, or ureterolithiasis, describes the formation of calculi within the urinary collecting system, otherwise known as renal calculi or ureteral stones. The typical presentation of renal calculi that have become lodged in the ureter (ureterolithiasis) includes severe, intermittent, sharp flank pain with either gross or microscopic hematuria, leukocytosis, and, occasionally, evidence of a concomitant urinary tract infection. Calcium-containing stones are the most common varieties, although renal calculi may also be composed of cystine, struvite, and uric acid. While abdominal plain x-rays were traditionally used for diagnosis, urate stones are radiolucent, and given the availability and sensitivity of advanced imaging, a noncontrast CT scan of the abdomen and pelvis is now the preferred imaging modality for definitive diagnosis. One exception to this is in pediatrics, where imaging modalities that involve less radiation, such as ultrasonography and x-ray, are often used before modalities such as CT. Acute management depends on the size and location of the calculi in addition to complicating factors such as abnormal anatomy or the concurrent presence of a urinary tract infection. Calculi larger than 6 mm often require intervention as they are unlikely to pass on their own. For smaller calculi in clinically stable patients, treatment with oral hydration and analgesia is appropriate.

Incorrect Answers: A, C, D, E, and F.

Oral administration of allopurinol (Choice A) may be useful in the management of renal calculi composed of uric acid. Uric acid stones are typically radiolucent. This patient's stone is radiopaque, suggesting a stone composed of either calcium oxalate, calcium phosphate, or ammonium magnesium phosphate (struvite). Oral administration of potassium citrate (Choice D) is useful for urine alkalinization, which increases the solubility of uric acid, thereby preventing uric acid stone formation or aiding in the dissolution of existing uric acid stones.

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Oral administration of hydrochlorothiazide (Choice C) reduces renal excretion of calcium and is useful for preventing formation of calcium-based renal calculi. Thiazides are typically reserved for the prevention of recurrent calcium stones after dietary modification has failed.

Oral administration of pyridoxine (Choice E) is not recommended. Pyridoxine (vitamin B6) has been proposed to reduce renal oxalate excretion, thereby lowering the risk for formation of calcium oxalate stones. However, recent, large trials have not found pyridoxine to have a significantly beneficial effect in preventing the formation of renal calculi.

Lithotripsy (Choice F) is a method of using extracorporeal shock waves to fragment renal calculi, aiding in their passage. Most calculi less than 6 mm are able to pass spontaneously and do not require lithotripsy.

Educational Objective: Acute management of nephrolithiasis depends on the size and location of the calculi in addition to complicating factors such as abnormal anatomy or the concurrent presence of a urinary tract infection. Calculi larger than 6 mm often require intervention as they are unlikely to pass on their own. For smaller calculi in clinically stable patients, treatment with oral hydration and analgesia is appropriate.

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43. A previously healthy 57-year-old woman comes to the physician because of a 6-month history of muscle weakness and fatigue. The weakness began in the muscles of her face and has progressed to all of the muscles in her body. Examination shows bilateral ptosis and weakness of the left abducens muscle. An x-ray of the chest shows a mediastinal mass. Which of the following is the most appropriate next step in diagnosis of this patient's neurologic findings?

A) Nerve conduction studies with repetitive stimulation
B) MRI of the cervical spine
C) Somatosensory evoked potentials
D) Biopsy of a peripheral nerve
E) Biopsy of a skeletal muscle

Correct Answer: A.

Myasthenia gravis is an autoimmune disorder of neuromuscular transmission that has a bimodal age of onset, peaking in both young adults (teens to 20s) and older adults (50s to 60s). Patients with myasthenia gravis possess antibodies that block or destroy nicotinic acetylcholine receptors (nAChRs), which interferes with neuromuscular junction signaling. Many patients with myasthenia gravis have thymic hyperplasia or thymoma. In myasthenia gravis, the thymus, which is the site of T-lymphocyte maturation, may show abnormalities in the presentation of the nAChR as an antigen to helper T lymphocytes. This abnormal antigen presentation is postulated to result in autoimmune attack of the nAChR on skeletal muscle cells. Patients present with progressively worsening skeletal muscle weakness at rest and fatigability on activation in focal or generalized muscle groups. Thus, nerve conduction studies with repetitive stimulation are used to confirm the diagnosis. The ocular, bulbar, and neck muscles are commonly affected. Most concerningly, respiratory muscle weakness can lead to respiratory insufficiency, and in an acute flare, these patients may require mechanical ventilation. Management includes symptomatic treatments such as acetylcholinesterase inhibitors along with immune modulating therapies. In patients with or without thymoma, complete thymectomy may be curative.

Incorrect Answers: B, C, D, and E.

MRI of the cervical spine (Choice B) would be helpful in diagnosing central cord syndrome, which presents with decreased sensation and strength of the upper extremities. However, bulbar weakness would not be present.

Somatosensory evoked potentials (Choice C) are used to evaluate electrical activity of the brain resulting from stimulation of peripheral sensory fibers to assess somatosensory functioning. Myasthenia gravis is a disorder of neuromuscular, not somatosensory transmission.

Biopsy of a peripheral nerve (Choice D) can be helpful in diagnosing causes of peripheral neuropathy such as mononeuritis multiplex. This patient presents with symptoms of bulbar weakness, which are muscles supplied by cranial nerves. Biopsy may be helpful to exclude alternative diagnoses, however nerve conduction studies would be performed first.

Biopsy of a skeletal muscle (Choice E) would be helpful in diagnosing inflammatory disorders of the muscle such as dermatomyositis, polymyositis, or inclusion body myositis. It is characterized by infiltration of inflammatory cells (generally lymphocytes and macrophages) on histology along with fibrosis.

Educational Objective: Myasthenia gravis is an autoimmune disorder of neuromuscular transmission with progressively worsening skeletal muscle weakness at rest and fatigability on activation in focal or generalized muscle groups. Nerve conduction studies with repetitive stimulation are used to confirm the diagnosis.

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44. A 29-year-old woman, gravida 1, para 1, comes to the physician 1 week after noticing a mildly tender lump in her left breast. Five months ago, she delivered a healthy newborn at term following an uncomplicated pregnancy and spontaneous vaginal delivery. She is breast-feeding and says her infant feeds equally from both breasts. The patient has no history of serious illness, and her only medication is a prenatal vitamin. Her mother was diagnosed with breast cancer at the age of 61 years. The patient's vital signs are within normal limits. Examination shows no axillary or supraclavicular lymphadenopathy. There is a 3-cm, smooth, mobile, cystic, tender mass in the upper outer quadrant of the left breast. Which of the following is the most appropriate next step in management?

A) Bromocriptine therapy
B) Dicloxacillin therapy
C) Discontinuing breast-feeding
D) Fine-needle aspiration of the mass
E) Increasing breast-feeding on the left breast

Correct Answer: D.

A galactocele is a benign cyst of the mammary glands, caused by an obstruction to lactiferous duct outflow. Given its location, it is filled with milk rather than clear fluid. They occur in lactating women, or women who recently discontinued lactating, and present with a firm, fluctuant mass that is painless or mildly tender, commonly located in the subareolar area. Vital signs will be within normal limits. Diagnosis is typically clinical but can also be based on fine-needle aspiration, which would be the most appropriate next step in management for this patient. If obtained, ultrasonography would show a cystic mass. Galactoceles generally resolve on their own but can be aspirated or excised if they persist and are symptomatic. Complications are uncommon but include superimposed infection and abscess formation, as well as rupture and subsequent inflammation.

Incorrect Answers: A, B, C, and E.

Bromocriptine therapy (Choice A) is often used in the treatment of prolactinomas or hyperprolactinemia, which can present with galactorrhea. It does not play a role in the treatment of galactocele.

Dicloxacillin therapy (Choice B) is used to treat skin and soft tissue infections, such as those caused by *Staphylococcal* and *Streptococcal* species. It can be used in the treatment of mastitis or breast abscess, which present with erythema, induration, and pain of the breast. This patient has a fluctuant mass with no systemic symptoms such as fever, which is more representative of a galactocele.

Discontinuing breast-feeding (Choice C) or increasing breast-feeding on the left breast (Choice E) would not affect this patient's galactocele. While commonly occurring in lactating women, changes in breast-feeding have not consistently been associated with an improvement in galactocele symptoms. Rather, this patient should undergo fine-needle aspiration to confirm the diagnosis and improve her symptoms.

Educational Objective: A galactocele is a benign cyst of the mammary glands, caused by an obstruction to lactiferous duct outflow. They commonly present with a firm, fluctuant mass that is painless or mildly tender in lactating women. Diagnosis is based on physical examination and the results of a fine-needle aspiration, which will show milky fluid.

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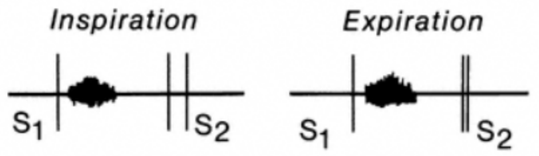

45. An 18-year-old man is brought to the physician 1 hour after he felt light-headed while playing basketball. He has not had chest pain, palpitations, or shortness of breath. He has no history of serious illness and takes no medications. His father died in a motor vehicle collision at the age of 35 years. There is no family history of serious illness. The patient's pulse is 80/min, and blood pressure is 115/85 mm Hg. There is no jugular venous distention. Pulmonary examination shows no abnormalities. A diagram of cardiac auscultation is shown. The murmur does not change with inspiration, position, or Valsalva maneuver. An ECG shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Aortic valve repair
B) Implantation of a cardiac defibrillator
C) Recommendation not to play competitive sports
D) Warfarin therapy
E) No management is indicated at this time

Correct Answer: E.

No management is indicated at this time for this otherwise healthy 18-year-old patient with no apparent risk factors for cardiac disease. Benign murmurs are common in childhood and adolescence and do not require treatment. They are also referred to as innocent murmurs and result from normal blood flow. However, the clinician should consider the possibility of serious cardiac disease, as a murmur may be the single presenting feature. Risk factors include a family history of cardiac disease or sudden cardiac death, exposure to teratogens in utero, or a prior history of mucocutaneous lymph node syndrome (Kawasaki disease) or rheumatic fever. On physical examination, a holosystolic or diastolic murmur should prompt concern and further evaluation. Additionally, since benign murmurs arise from normal blood flow, they should decrease in intensity with maneuvers that decrease blood return to the heart, such as the Valsalva maneuver, though this is not always apparent in the clinical setting. Further workup is indicated if the patient presents with vital sign abnormalities and/or significant symptoms, especially chest pain, syncope, palpitations, shortness of breath, poor exercise tolerance, or failure to thrive.

Incorrect Answers: A, B, C, and D.

Aortic valve repair (Choice A) would be indicated if this patient's symptoms were caused by a bicuspid aortic valve or other congenital valve defect. The cardiac auscultation characteristics in a stenosed valve may include a mid-systolic ejection murmur, an abnormally quiet S_2 caused by impaired closing of the valve, and paradoxical splitting of the S_2.

Implantation of a cardiac defibrillator (Choice B) would be recommended if the patient was at risk for torsades de pointes from congenital long QT syndrome or if there was concern for hypertrophic, obstructive cardiomyopathy. Additionally, there would be a strong recommendation not to play competitive sports (Choice C) given risk for sudden cardiac death. However, this patient has no family history of cardiac conduction abnormalities nor concerning features on his ECG.

Warfarin therapy (Choice D) is indicated for patients with atrial septal defects or ventricular septal defects who are at risk for paradoxical thromboembolism. Atrial septal defects are associated with a fixed

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Warfarin therapy (Choice D) is indicated for patients with atrial septal defects or ventricular septal defects who are at risk for paradoxical thromboembolism. Atrial septal defects are associated with a fixed split S_2, and ventricular septal defects tend to have a holosystolic murmur, neither of which is present on the cardiac auscultation tracing.

Educational Objective: Benign murmurs are common in childhood and adolescence, and most cases can be managed with observation. Patients who present with severe cardiopulmonary symptoms, have a family history of cardiac disease, or are at risk for congenital or acquired heart defects from prior exposures should receive further workup.

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✓ 46. A 37-year-old woman is brought to the emergency department 30 minutes after an episode of syncope at a shopping mall. She says she had shortness of breath and was sweating before she passed out. She has a childhood history of asthma. She currently has panic disorder and gastroesophageal reflux disease. Current medications include sertraline, omeprazole, and an oral contraceptive. On arrival, she is alert and oriented to person, place, and time. Her temperature is 37.4°C (99.3°F), pulse is 110/min, and blood pressure is 90/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. Examination, including neurologic examination, shows no abnormalities. Laboratory studies show:

Hemoglobin	12 g/dL
Hematocrit	36%
Leukocyte count	9000/mm^3

Arterial blood gas analysis on room air:

pH	7.46
Pco_2	30 mm Hg
Po_2	62 mm Hg

Which of the following is the most likely explanation for these findings?

A) Asthma
B) Congestive heart failure
C) Panic episode
D) Pneumonia
E) Pulmonary embolism

Correct Answer: E.

This patient's presentation and findings are concerning for acute pulmonary embolism (PE). It classically presents with acute chest pain, shortness of breath, and hypoxemia. Some patients may also experience unexplained syncope. It is often difficult to distinguish PE from other acute respiratory disorders, and the differential includes asthma exacerbation, vocal cord dysfunction, acute coronary syndrome, panic episode, and vasovagal syncope. The clinician must maintain a high index of suspicion, and the use of clinical decision aids such as Wells score is recommended. Risk factors for acute PE include immobility, obesity, recent surgery, malignancy, pregnancy, use of oral contraceptives, trauma, fracture of long bones, and inherited thrombophilia. ECG often displays normal sinus rhythm or sinus tachycardia. Arterial blood gas analysis most typically shows acute respiratory alkalosis, hypoxemia, and an increased A-a gradient caused by ventilation-perfusion mismatch. CT pulmonary angiography is the preferred method to confirm the diagnosis. This patient may be experiencing a massive PE given tachycardia and borderline hypotension, and she should be treated with anticoagulants and also potentially thrombolytics.

Incorrect Answers: A, B, C, and D.

Asthma (Choice A) exacerbation typically presents with wheezing, dry cough, and dyspnea. Syncope is less common.

Congestive heart failure (Choice B) is unlikely, given the absence of associated physical examination findings. These include jugular venous distension, peripheral edema, ascites, hepatojugular reflux

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Which of the following is the most likely explanation for these findings?

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Incorrect Answers: A, B, C, and D.

Asthma (Choice A) exacerbation typically presents with wheezing, dry cough, and dyspnea. Syncope is less common.

Congestive heart failure (Choice B) is unlikely, given the absence of associated physical examination findings. These include jugular venous distension, peripheral edema, ascites, hepatojugular reflux, pulmonary crackles, and an S_3 or S_4 gallop.

Panic episode (Choice C) may be considered, but other reversible causes of this patient's symptoms should be assessed first. Patients in acute panic episode typically hyperventilate, which does cause respiratory alkalosis on arterial blood gas analysis; however, a normal A-a gradient and normal oxygenation would be expected.

Pneumonia (Choice D) would be unlikely, as it typically presents with dyspnea, productive cough, and signs of systemic inflammation such as fever and malaise. Leukocytosis would also support infection as the cause of the patient's symptoms.

Educational Objective: Acute pulmonary embolism (PE) classically presents with acute chest pain, shortness of breath, and hypoxemia; however, vague and nonspecific presentations are common. Unexplained syncope should prompt consideration for PE, especially in the setting of risk factors such as immobility, obesity, recent surgery, malignancy, pregnancy, use of oral contraceptives, trauma, fracture of long bones, and inherited thrombophilia.

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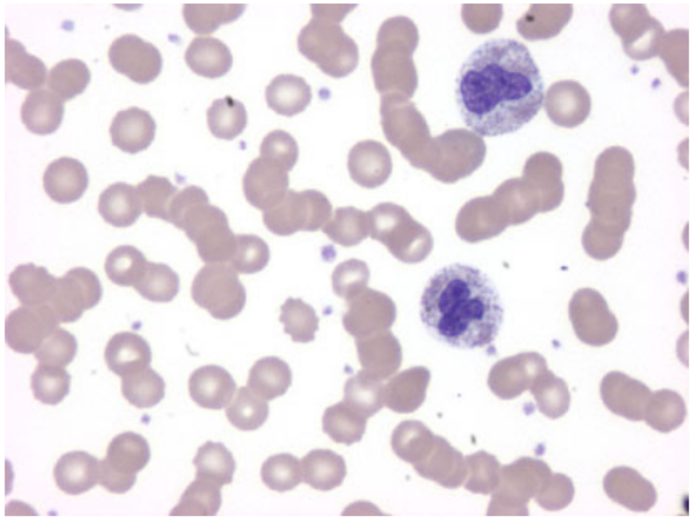
47. A 62-year-old woman comes to the physician because of a 2-month history of generalized fatigue and mild low back pain. She has not had any other symptoms. She has no history of serious illness and takes no medications. Her last health maintenance examination was 10 months ago, and a complete blood count at that time was within the reference range. Examination today shows no abnormalities. Laboratory studies show:

Hematocrit	30%
Mean corpuscular volume	103 µm^3
Leukocyte count	8200/mm^3
Segmented neutrophils	67%
Bands	4%
Lymphocytes	29%
Platelet count	165,000/mm^3
Serum	
Ca^{2+}	10.9 mg/dL
Creatinine	1.8 mg/dL



A blood smear is shown. Which of the following is the most appropriate next step to confirm the diagnosis?

A) Liver function tests
B) Measurement of serum vitamin B_{12} (cobalamin) concentration
C) Serum iron studies
D) Colonoscopy
E) Bone marrow biopsy

Correct Answer: E.

This patient's presenting findings of bone pain, anemia, hypercalcemia, and renal dysfunction are consistent with a diagnosis of multiple myeloma. Multiple myeloma is a malignancy caused by the neoplastic proliferation of plasma cells. Neoplastic plasma cells overproduce monoclonal immunoglobulin light or heavy chains, which may result in acute renal failure. Patients commonly present with constitutional symptoms of fatigue and weight loss, lytic bone lesions, hepatosplenomegaly, symptoms of hypercalcemia (eg, abdominal cramping, kidney stones, psychiatric disturbance), symptoms of anemia (eg, pallor, lightheadedness, dyspnea on exertion), or with opportunistic infections secondary to immune dysfunction. Further workup is recommended with a complete blood count, complete metabolic panel, urinalysis, urine and serum protein electrophoresis, and imaging to determine the extent of malignancy. Peripheral blood smear classically discloses red blood cell aggregation in a rouleaux formation. The diagnosis is confirmed with bone marrow biopsy.

Incorrect Answers: A, B, C, and D.

Liver function tests (Choice A) frequently disclose hepatic dysfunction in patients with multiple myeloma, often caused by infiltration of the liver by plasma cells. However, abnormal liver function testing is nonspecific and not helpful in confirming the diagnosis.

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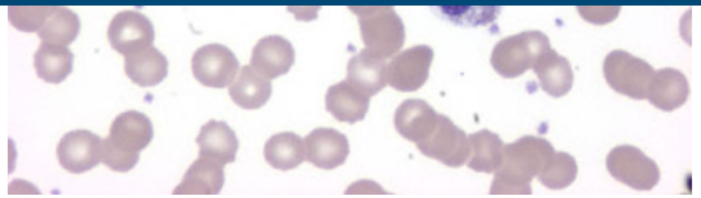
Platelet count	165,000/mm^3
Serum	
Ca^{2+}	10.9 mg/dL
Creatinine	1.8 mg/dL



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Incorrect Answers: A, B, C, and D.

Liver function tests (Choice A) frequently disclose hepatic dysfunction in patients with multiple myeloma, often caused by infiltration of the liver by plasma cells. However, abnormal liver function testing is nonspecific and not helpful in confirming the diagnosis.

Measurement of serum vitamin B_{12} (cobalamin) concentration (Choice B) is not helpful for confirming the diagnosis of multiple myeloma. Some patients with multiple myeloma may display megaloblastic anemia, which is typically caused by the underlying excessive utilization of folate during the neoplastic production of plasma cells.

Serum iron studies (Choice C) and colonoscopy (Choice D) are useful for the evaluation of iron deficiency anemia, which often occurs secondary to dietary iron deficiency, menstrual abnormalities, or chronic gastrointestinal bleeding. However, iron deficiency anemia classically presents with microcytosis, rather than macrocytosis.

Educational Objective: Multiple myeloma is a malignant plasma cell neoplasm that typically presents with fatigue, weight loss, bone pain, hepatosplenomegaly, immune deficiency, anemia, hypercalcemia, renal dysfunction, hypergammaglobulinemia, and lytic bone lesions. Peripheral blood smear discloses red blood cell aggregation in a rouleaux formation. The diagnosis is confirmed by bone marrow biopsy.

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48. A 37-year-old man comes to the physician for a routine health maintenance examination. He feels well. He has no history of serious illness and takes no medications. He received the hepatitis B vaccine at the age of 28 years. He does not smoke or drink alcohol. During the past 6 months, he has been sexually active with one male partner, and they do not use condoms. The patient works as an accountant and has not traveled outside the USA. Examination shows no abnormalities. A blood sample is obtained for serum lipid studies and an HIV antibody test. In addition to counseling this patient about risk factors for sexually transmitted diseases, which of the following is the most appropriate next step in management?

A) PPD skin test
B) *Haemophilus influenzae* type b vaccine
C) Hepatitis A vaccine
D) Meningococcal vaccine
E) Pneumococcal polysaccharide vaccine, 23-valent

Correct Answer: C.

Hepatitis A virus (HAV) is a nonenveloped, single-stranded RNA virus that is spread through fecal-oral transmission. It is a common, yet preventable cause of liver disease. It is commonly acquired through the ingestion of poorly cooked, improperly handled, or raw foods. Presenting signs and symptoms include fever, nausea, vomiting, poor appetite, abdominal pain, jaundice, and hepatomegaly, although many patients are asymptomatic. Laboratory findings include transaminitis, increased alkaline phosphatase, hyperbilirubinemia, and bilirubinuria. Liver biopsy is not routinely required but may show ballooning hepatocyte degeneration and Councilman bodies. Outbreaks of HAV are common among men who have sex with men (MSM). The Centers for Disease Control Advisory Committee on Immunization Practices (CDC ACIP) recommends routine vaccination against HAV among MSM patients, as well as other high-risk populations, including international travelers to high-risk areas, HIV-positive patients, patients experiencing homelessness, and users of injection drugs. The HAV vaccine is an inactivated vaccine and is given via intramuscular injection in a series of two injections.

Incorrect Answers: A, B, D, and E.

PPD skin test (Choice A) is useful for the identification of tuberculosis and is indicated in health care personnel and other high-risk populations, such as patients with HIV or patients who use injection drugs. PPD testing is not routinely recommended for MSM patients.

Haemophilus influenzae type b vaccine (Choice B) is a conjugate vaccine for the prevention of infections caused by *H. influenzae* type b. *H. influenzae* is a gram-negative bacterium that can result in various mucosal infections such as conjunctivitis, otitis media, bronchitis, and pneumonia. The vaccine is given in a four-dose series beginning at age 2 months.

Meningococcal vaccine (Choice D) is indicated for all children, with an additional serogroup B vaccine indicated for all children over age 10 years at increased risk for meningococcal disease (eg, dormitory, military living).

Pneumococcal polysaccharide vaccine, 23-valent (Choice E) is indicated for all adults over age 65 years and for patients with high-risk conditions such as chronic heart, renal, and liver disease or chronic smokers.

Educational Objective: Hepatitis A virus is a common but preventable cause of liver disease. Outbreaks are common among men who have sex with men. The Centers for Disease Control Advisory Committee on Immunization Practices recommends routine vaccination among men having sex with men, as well as other high-risk populations.

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49. A 27-year-old man comes to the physician because of a 1-month history of sudden episodes of a "scary choking feeling." He has had three episodes during this period; the episodes are accompanied by nausea, sweating, and "heart pounding" sensations. The symptoms peak within 5 to 10 minutes and disappear about 15 minutes later. The first two episodes "came out of the blue" while he was at work; the last episode occurred when he was stuck in traffic. He is fearful that he will have another episode and that "someone will notice and think I'm going crazy." He has no history of serious medical illness and takes no medications. He is a veteran of the U.S. Marine Corps and experienced some intense fighting 5 years ago. He has occasional nightmares involving combat and intermittent sadness when he thinks about military comrades who were killed. He has occasional difficulty falling asleep. He has had no changes in energy level or appetite. He is 175 cm (5 ft 9 in) tall and weighs 82 kg (180 lb); BMI is 27 kg/m^2. Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, he is anxious but relates well with the physician. His serum thyroid-stimulating hormone concentration is within the reference range. A 12-lead ECG shows a normal sinus rhythm. Which of the following is the most appropriate pharmacotherapy?

A) Bupropion
B) Buspirone
C) Haloperidol
D) Lithium carbonate
E) Paroxetine
F) Risperdal

Correct Answer: E.

Panic disorder features panic attacks that occur unexpectedly and are associated with changes in behavior to avoid panic attack triggers. Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with four additional physical symptoms or associated mental states. These additional symptoms may include heart palpitations or tachycardia, shortness of breath, chest pain, dizziness, the sensation of choking, gastrointestinal distress, paresthesias, sweating, chills, trembling, derealization, fear of dying, and/or fear of losing control. In patients with an initial episode of panic symptoms, a thorough history and physical examination along with a basic laboratory workup and a potential ECG should be performed. Panic disorder can be distinguished from post-traumatic stress disorder by the absence of several characteristic features, such as re-experiencing the initial traumatic event, symptoms being triggered by reminders of the traumatic event, hyperarousal, such as increased vigilance or exaggerated startle response, and negative symptoms, such as depressed mood, loss of interest, or difficulty concentrating. Treatment of panic disorder typically includes psychotherapy, selective serotonin reuptake inhibitors, such as paroxetine, and short-term benzodiazepines. Other classes of medications that may be used for treating panic disorder include monoamine oxidase inhibitors and tricyclic antidepressants.

Incorrect Answers: A, B, C, D, and F.

Bupropion (Choice A) is a dopamine/norepinephrine reuptake inhibitor, which is used as an antidepressant and smoking cessation aid. It is not known to be effective in the treatment of panic disorder.

Buspirone (Choice B) is a serotonin modulator utilized to treat generalized anxiety disorder. Its use is not well-supported in the treatment of panic disorder.

Haloperidol (Choice C) is an antipsychotic medication that reversibly antagonizes D_2 receptors, blocking dopamine's downstream effects nonspecifically across different brain regions. It has no role in the treatment of panic disorder.

Lithium carbonate (Choice D) is a mood stabilizer medication utilized in bipolar disorder and schizophrenia

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Lithium carbonate (Choice D) is a mood stabilizer medication utilized in bipolar disorder and schizophrenia.

Risperdal (Choice F) is an atypical antipsychotic that is useful for the treatment of bipolar disorder and schizophrenia.

Educational Objective: Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with symptoms of sympathetic hyperactivity such as tachycardia, heart palpitations, sweating, and trembling, along with shortness of breath, chest pain, dizziness, gastrointestinal distress, and paresthesias. Panic disorder is characterized by recurrent panic attacks that are unexpected and associated with worry about future panic attacks or avoidance of panic attack triggers. The most appropriate pharmacotherapy is selective serotonin reuptake inhibitors, such as paroxetine.

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50. A previously healthy 25-year-old man is brought to the emergency department 2 hours after being involved in a motor vehicle collision. He was the restrained driver. On arrival, he is alert and oriented to person, place, and time. He says he has severe lower abdominal pain. His temperature is 37.5°C (99.5°F), pulse is 105/min, respirations are 18/min, and blood pressure is 120/70 mm Hg. Abdominal examination shows ecchymoses over the lower quadrants and an abrasion where the seat belt was fastened. There is suprapubic tenderness. Palpation of the iliac crests produces pain. There is blood at the urethral meatus. His hematocrit is 30%. X-rays of the pelvis show a fracture of the superior and inferior right pubic rami and the right sacroiliac joint. Which of the following is the most appropriate next step in management?

A) Cystography
B) Retrograde urethrography
C) Placement of a suprapubic catheter
D) Intravenous pyelography
E) Bladder irrigation

Correct Answer: B.

Blood at the urethral meatus following trauma raises concern for a urethral injury. Urethral injuries are characterized by difficulty voiding, blood at the urethral meatus, perineal ecchymosis, and may be associated with a pelvic fracture. Straddle injuries can cause trauma to the anterior urethra, while pelvic fractures may injure the posterior urethra. Urethral injuries are evaluated with retrograde urethrography, which involves the injection of contrast into the urethra to evaluate for the extravasation of contrast, indicating urethral discontinuity. Depending on the location and severity of urethral injury, patients may require surgical repair or the placement of a urethral catheter to help promote healing and prevent complications of urinary extravasation, infection, urethrocutaneous fistula, or urethral stricture.

Incorrect Answers: A, C, D, and E.

Cystography (Choice A) is indicated for evaluation of the urinary bladder when a bladder injury is suspected. This allows for characterization of an intraperitoneal versus extraperitoneal bladder rupture, which dictates the next step in management.

Placement of a suprapubic catheter (Choice C) may be necessary, but first, delineation of injury location and pattern should occur. An indwelling urethral catheter is less invasive than a suprapubic catheter and is preferred if insertion would not exacerbate trauma.

Intravenous pyelography (Choice D) involves the intravenous injection of radiopaque contrast to subsequently visualize the kidney collecting system, ureters, and bladder under fluoroscopy. This allows for the investigation of suspected urinary tract anatomic abnormalities, malignancies, and strictures.

Bladder irrigation (Choice E) would be helpful in the management of hematuria but would not be indicated in urethral injury. In addition, bladder irrigation is typically done with a urinary catheter, and insertion of a urinary catheter is contraindicated in urethral injuries until the location and pattern of such injury is known.

Educational Objective: Urethral injuries can occur from straddle injuries (anterior urethra) or pelvic fractures (posterior urethra). Retrograde urethrography allows evaluation of the urethra as a source of hematuria.

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1. A 47-year-old woman comes to the physician because of a 3-week history of moderate pain in her arms and legs. She states that her "bones ache" in all joints both at rest and with movement. She has hypertension, hyperlipidemia, and type 2 diabetes mellitus well controlled with diet. Current medications include hydrochlorothiazide and simvastatin. Her sister has Sjögren syndrome, and her mother has coronary artery disease. The patient does not smoke and drinks one glass of wine daily. Her blood pressure is 144/80 mm Hg. Cardiopulmonary examination shows no abnormalities. There is tenderness to palpation over the wrist, metacarpophalangeal, knee, and ankle joints. Clubbing of the fingers and toes is noted. A chest x-ray shows a left upper lobe mass with perihilar lymphadenopathy. X-rays of the tibia and fibula show periostosis. Which of the following is the most likely diagnosis?

A) Bone metastases
B) Hypertrophic pulmonary osteoarthropathy
C) Neuropathic arthropathy (Charcot joint)
D) Sarcoidosis
E) Systemic sclerosis (scleroderma)

Correct Answer: B.

Hypertrophic osteoarthropathy (HOA) is a syndrome caused by abnormal fibrovascular proliferation and is characterized by the triad of digital clubbing, periostosis (inflammation of the periosteum, particularly of the long bones), and severe arthralgia. It may be caused by rare congenital conditions, but most cases are secondary to a noncongenital condition. Of these, pulmonary pathology is the most common cause. The pathophysiology is associated with hypoxemia-related changes in systemic growth factor regulation. Other causes include primary cardiac, gastrointestinal, or hepatic disease, as well as metastatic malignancy. Patients present with debilitating arthralgia which is often initially diagnosed as inflammatory arthritis. However, for this patient, the finding of a lung mass with regional lymphadenopathy makes secondary HOA as a result of pulmonary malignancy the most likely diagnosis.

Incorrect Answers: A, C, D, and E.

Bone metastases (Choice A) typically appear as destructive lesions on plain x-rays, with patchy areas of decreased bone density, disruptions in the normal bone architecture, or lesions with a sclerotic lining. A mix of lytic and sclerotic features may be present depending on the primary malignancy.

Neuropathic arthropathy (Charcot joint) (Choice C) occurs secondary to repetitive minor injuries that are not noticed by the patient as a result of underlying afferent sensory nerve dysfunction (eg, in diabetic neuropathy). This results in progressive osteolysis with destruction, fragmentation, erosion, and misalignment of bony articulations.

Sarcoidosis (Choice D) is a noncaseating granulomatous disease that often involves the lung, and bilateral perihilar lymphadenopathy is a characteristic imaging finding. Bone involvement usually manifests with chronic arthritis and cysts on imaging caused by areas of periosteal resorption. The presence of a lung mass and periostosis on imaging make lung malignancy with HOA a more likely diagnosis.

Systemic sclerosis (scleroderma) (Choice E) is an autoimmune disorder characterized by collagen deposition and progressive fibrosis of the skin, soft tissues, and internal organs as well as noninflammatory vasculopathy. The presence of a lung mass and periostosis on imaging make lung malignancy with HOA a more likely diagnosis.

Educational Objective: Hypertrophic osteoarthropathy is a syndrome caused by abnormal fibrovascular proliferation and is characterized by the triad of digital clubbing, periostosis, and severe arthralgia. It is frequently associated with chronic pulmonary pathology and malignancy.

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2. A healthy 16-year-old girl comes to the physician for a school physical examination. She is sexually active with one partner and does not use contraception. She has smoked one pack of cigarettes daily for 2 years. She is 163 cm (5 ft 4 in) tall and weighs 70 kg (156 lb); BMI is 27 kg/m^2. Physical examination shows no abnormalities. Which of the following behavioral modifications is most likely to have the greatest impact on mortality in this patient during the next 10 years?

A) Condom use
B) Monthly breast self-examination
C) Seat belt use
D) Smoking cessation
E) Weight loss

Correct Answer: C.

The most common cause of death in teens and young adults is accidental death, frequently in relation to fatal motor vehicle collisions. This is followed by homicide, suicide, malignancy, and heart disease. This patient has several factors that are likely to lead to adverse health outcomes, such as being overweight, using tobacco products, and having unprotected intercourse. Being overweight increases the likelihood of diabetes mellitus, hypertension, hyperlipidemia, and heart disease, while tobacco use can increase these things as well as the likelihood of cancer after years of use. Unprotected intercourse can lead to sexually transmitted infections and unintended pregnancy. While complicated pregnancy can lead to death, it is much less common than accidental death in young adults. Thus, the behavioral modification that is most likely to have the greatest impact on this patient's mortality during the next 10 years is increasing her seat belt use.

Incorrect Answers: A, B, D, and E.

Condom use (Choice A) would decrease the risk for sexually transmitted infections and unintended pregnancy. While sexually transmitted infections can be associated with long-term complications and complicated pregnancy can lead to death, these outcomes are much less likely than accidental death caused by a motor vehicle collision.

Monthly breast self-examination (Choice B) is used to evaluate for the development of lumps that may signify breast cancer to promote early detection. Breast cancer is rare in young patients, unless the patient carries a *BRCA1* or *BRCA2* mutation, which may present with a positive family history. Therefore, this is unlikely to decrease the risk of mortality to this patient during the next 10 years in comparison to avoiding traumatic injury.

Smoking cessation (Choice D) would be of benefit in this case, as long-term tobacco use can lead to chronic obstructive pulmonary disease, heart disease, and lung cancer, among other problems. However, tobacco use is unlikely to lead to death in the next 10 years.

Weight loss (Choice E) would not improve this patient's mortality during the next ten years. She is only mildly overweight with a BMI of 27 kg/m^2, and additional weight loss would be unlikely to lead to improved mortality during the next 10 years. However, if she remained overweight long-term or her BMI increased into the obesity range, she would be at increased risk for the development of diabetes, hypertension, and heart disease, which carry an increased risk of mortality.

Educational Objective: The most common cause of death in teens and young adults is accidental death, frequently caused by motor vehicle collisions. All teens and young adults should therefore be encouraged to wear seat belts in vehicles to decrease their risk. Other health behaviors that should be encouraged in this patient population include exercise, maintaining a healthy weight, abstaining from tobacco use, and avoiding excessive alcohol use.

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3. An 82-year-old woman who resides in a skilled nursing care facility is transferred to the hospital because of a 2-day history of fever and cellulitis of the left side of her face. She is hemiparetic, aphasic, and unable to swallow. She is fed through a gastrostomy tube. She has congestive heart failure, type 2 diabetes mellitus, hypertension, hyperlipidemia, major depressive disorder, and osteoporosis. Her medications are furosemide, metoprolol, digoxin, glyburide, lisinopril, carvedilol, atorvastatin, amitriptyline, alendronate, and 81-mg aspirin. She appears ill and moans frequently. Her temperature is 39.1°C (102.4°F), pulse is 84/min, respirations are 24/min, and blood pressure is 112/72 mm Hg. A firm, exquisitely tender mass is palpated from the left cheek to the angle of the mandible; this area is also erythematous and edematous. The left pinna appears normal, and the otic canal is not inflamed. The mouth is dry. Bilateral basilar crackles are heard. Cardiac examination shows no abnormalities. The abdomen is soft and nontender. The gastrostomy tube is in place with no inflammation. Her leukocyte count is 28,000/mm^3 (78% segmented neutrophils, 18% bands, and 4% lymphocytes), and serum glucose concentration is 168 mg/dL. A chest x-ray shows cardiomegaly; there are bilateral basilar increased markings and atelectasis in the left lung base but no focal infiltrates. Which of the following is the most likely cause of this patient's fever?

A) Acute suppurative parotitis
B) Aspiration pneumonia
C) Mandibular osteomyelitis
D) Osteonecrosis of the jaw
E) Urinary tract infection

Correct Answer: A.

Facial swelling, erythema, and edema at the angle of the mandible accompanied by fever raises suspicion for acute suppurative parotitis. Acute parotitis is most often caused by mixed oral flora and *Staphylococcus aureus*. Risk factors for the development of parotitis include being elderly, dehydration, poor dentition, lack of salivary flow (in setting of poor or absent chewing or oral intake), or debilitation. In addition, the parotid duct can be obstructed by calculi or tumor, which can predispose patients to infection. The diagnosis is clinical, and imaging with an ultrasound or CT scan can further evaluate for the presence of complications, such as abscess formations or a tumor. Imaging can also delineate involved structures when the diagnosis is unclear, or differential remains mixed. Management of acute suppurative parotitis involves administration of intravenous antibiotics and monitoring to evaluate for clinical improvement.

Incorrect Answers: B, C, D, and E.

Aspiration pneumonia (Choice B) presents with cough, shortness of breath, pleuritic chest pain, fever, and abnormal breath sounds. Chest x-ray will show patchy infiltrates, most commonly in the right lower lobe if the patient was upright while the aspiration occurred, or the posterior, gravity-dependent portions of the lungs if the patient was supine.

Mandibular osteomyelitis (Choice C) can cause jaw pain but is typically nonsuppurative and does not usually cause erythema and swelling unless severe or rapidly progressing. The diagnosis cannot be excluded on the clinical picture alone in this case, but is less likely.

Osteonecrosis of the jaw (Choice D) can occur in the setting of radiation cancer treatments, steroid use, or use of bisphosphonates. It does not typically cause fever, erythema, or swelling as seen in parotitis.

Urinary tract infection (Choice E) is a common cause of fever and sepsis in skilled nursing facilities. However, in the setting of facial cellulitis and an edematous tender mass on the left cheek, acute parotitis is more likely.

Educational Objective: Acute suppurative parotitis clinically presents with fever, unilateral erythema, tenderness, and swelling over the parotid gland. Management involves administration of intravenous

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39.1°C (102.4°F), pulse is 84/min, respirations are 24/min, and blood pressure is 112/72 mm Hg. A firm, exquisitely tender mass is palpated from the left cheek to the angle of the mandible; this area is also erythematous and edematous. The left pinna appears normal, and the otic canal is not inflamed. The mouth is dry. Bilateral basilar crackles are heard. Cardiac examination shows no abnormalities. The abdomen is soft and nontender. The gastrostomy tube is in place with no inflammation. Her leukocyte count is 28,000/mm^3 (78% segmented neutrophils, 18% bands, and 4% lymphocytes), and serum glucose concentration is 168 mg/dL. A chest x-ray shows cardiomegaly; there are bilateral basilar increased markings and atelectasis in the left lung base but no focal infiltrates. Which of the following is the most likely cause of this patient's fever?

A) Acute suppurative parotitis
B) Aspiration pneumonia
C) Mandibular osteomyelitis
D) Osteonecrosis of the jaw
E) Urinary tract infection

Correct Answer: A.

Facial swelling, erythema, and edema at the angle of the mandible accompanied by fever raises suspicion for acute suppurative parotitis. Acute parotitis is most often caused by mixed oral flora and *Staphylococcus aureus*. Risk factors for the development of parotitis include being elderly, dehydration, poor dentition, lack of salivary flow (in setting of poor or absent chewing or oral intake), or debilitation. In addition, the parotid duct can be obstructed by calculi or tumor, which can predispose patients to infection. The diagnosis is clinical, and imaging with an ultrasound or CT scan can further evaluate for the presence of complications, such as abscess formations or a tumor. Imaging can also delineate involved structures when the diagnosis is unclear, or differential remains mixed. Management of acute suppurative parotitis involves administration of intravenous antibiotics and monitoring to evaluate for clinical improvement.

Incorrect Answers: B, C, D, and E.

Aspiration pneumonia (Choice B) presents with cough, shortness of breath, pleuritic chest pain, fever, and abnormal breath sounds. Chest x-ray will show patchy infiltrates, most commonly in the right lower lobe if the patient was upright while the aspiration occurred, or the posterior, gravity-dependent portions of the lungs if the patient was supine.

Mandibular osteomyelitis (Choice C) can cause jaw pain but is typically nonsuppurative and does not usually cause erythema and swelling unless severe or rapidly progressing. The diagnosis cannot be excluded on the clinical picture alone in this case, but is less likely.

Osteonecrosis of the jaw (Choice D) can occur in the setting of radiation cancer treatments, steroid use, or use of bisphosphonates. It does not typically cause fever, erythema, or swelling as seen in parotitis.

Urinary tract infection (Choice E) is a common cause of fever and sepsis in skilled nursing facilities. However, in the setting of facial cellulitis and an edematous tender mass on the left cheek, acute parotitis is more likely.

Educational Objective: Acute suppurative parotitis clinically presents with fever, unilateral erythema, tenderness, and swelling over the parotid gland. Management involves administration of intravenous antibiotics and monitoring to evaluate for clinical improvement.

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4. A hospitalized 42-year-old man has chills and a temperature of 38.3°C (101°F) 1 hour after transfusion of packed red blood cells for treatment of anemia secondary to a bleeding duodenal ulcer. He has never received a blood transfusion in the past. He has no known allergies. He is pale and flushed. He is 178 cm (5 ft 10 in) tall and weighs 79 kg (175 lb); BMI is 25 kg/m^2. His pulse is 98/min and regular, and blood pressure is 128/82 mm Hg. Examination shows no abnormalities. The most appropriate next step in management is administration of which of the following?

A) Oral acetaminophen
B) Oral ibuprofen
C) Subcutaneous epinephrine
D) Intravenous diphenhydramine
E) Intravenous methylprednisolone

Correct Answer: A.

Febrile nonhemolytic transfusion reactions are caused by the release of cytokines from leukocytes during blood product storage and are a common transfusion reaction. It presents during or shortly after transfusion with isolated fever and possible rigors without other systemic symptoms. Laboratory and radiographic evaluations are unremarkable. Risk factors include the administration of platelets or red blood cells, especially in children, and long storage time of the blood products. Prestorage leukoreduction, or the removal of leukocytes from the blood products, decreases the risk for development by decreasing the extent of cytokine release. Treatment includes stopping the transfusion, treating the fever, and evaluating for other causes of fever. Therefore, in this patient with isolated fever following a blood transfusion, antipyretic treatment with oral acetaminophen is the most appropriate next step in management.

Incorrect Answers: B, C, D, and E.

Oral ibuprofen (Choice B) is a nonsteroidal anti-inflammatory drug used to treat inflammatory conditions, pain, and fever. While it may treat the fever associated with this patient's febrile nonhemolytic transfusion reaction, nonsteroidal anti-inflammatory drugs can cause gastritis, as well as gastric and duodenal ulcers. As this patient is already anemic from a bleeding duodenal ulcer, oral acetaminophen is a better choice than ibuprofen for treating fever.

Subcutaneous epinephrine (Choice C), intravenous diphenhydramine (Choice D), and intravenous methylprednisolone (Choice E) are used in the treatment of anaphylaxis, which can occur in response to blood product transfusion, most commonly in those with IgA deficiency. Anaphylaxis presents with bronchospasm with associated dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. Intravenous diphenhydramine can also be used to treat isolated hives or urticaria associated with blood product transfusion. This patient is presenting with isolated fever, indicative of a febrile nonhemolytic reaction, making oral acetaminophen the most appropriate next step in management.

Educational Objective: Febrile nonhemolytic transfusion reactions are a common type of reaction caused by the release of cytokines from leukocytes in stored blood products, especially platelets and red blood cells. Symptoms include isolated fever with possible rigors and without other systemic symptoms. Prestorage leukoreduction decreases the risk for development. Treatment includes stopping the transfusion and antipyretic administration, as well as evaluating for other causes of fever.

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5. A 77-year-old woman comes to the office because of a 1-year history of frequent urinary incontinence during the day and at night. The incontinence is not associated with coughing or sneezing, and she does not have urinary urgency before the episodes. She has not had pain with urination or vaginal discharge. She has a 10-year history of type 2 diabetes mellitus well controlled with metformin. Her other medications are atorvastatin and lisinopril. Examination shows some wetting of an absorbent pad that she is wearing. Results of laboratory studies are shown:

Hemoglobin A_{1c}	6.2%
Serum	
Na^+	138 mEq/L
K^+	3.7 mEq/L
Cl^-	98 mEq/L
HCO_3^-	26 mEq/L
Urea nitrogen	12 mg/dL
Glucose	180 mg/dL
Creatinine	1.1 mg/dL
Urine	
pH	normal
Glucose	1+
Protein	2+
RBC	none
WBC	3/hpf
Casts	none

Which of the following is the most likely cause of this patient's urinary incontinence?

A) Hyperglycemia
B) Interstitial cystitis
C) Medication adverse effect
D) Neurogenic bladder
E) Stress incontinence

Correct Answer: D.

Autonomic neuropathy is common in patients with both type 1 and type 2 diabetes mellitus. Autonomic neuropathy may occur independently of or accompanying peripheral sensory neuropathy. Autonomic neuropathy may present with cardiovascular manifestations of exercise intolerance or orthostasis; gastrointestinal manifestations such as gastroesophageal reflux, gastroparesis, or diarrhea; or genitourinary manifestations such as neurogenic bladder or erectile dysfunction. Neurogenic bladder results in impaired autonomic sensation of bladder filling with subsequent overflow or other neurologic patterns of incontinence. Overflow incontinence results in urinary retention, which is evidenced by an increased postvoid residual bladder volume. When the intravesical hydrostatic pressure eventually overwhelms the internal and external urinary sphincter closing pressures, the patient will demonstrate passive leakage of urine. Patients present with incomplete bladder emptying and a weak urinary stream.

Incorrect Answers: A, B, C, and E

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Protein	2+
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Incorrect Answers: A, B, C, and E.

Hyperglycemia (Choice A) may lead to polyuria in the setting of diabetes mellitus. While polyuria commonly causes urinary frequency and urgency, it does not usually cause incontinence.

Interstitial cystitis (Choice B) is an idiopathic, inflammatory disorder of the bladder that presents with urinary frequency, urgency, chronic suprapubic pain, and dyspareunia. It does not present with overflow incontinence.

Medication adverse effects (Choice C) do not usually cause incontinence. Use of diuretics may lead to polyuria with urinary frequency and urgency.

Stress incontinence (Choice E) refers to incontinence that is triggered by an increase in intra-abdominal pressure (eg, lifting, sneezing, Valsalva maneuver). Stress incontinence results from urethral hypermobility caused by pelvic floor weakness or prolapse, or intrinsic sphincter deficiency. Risk factors include multiple vaginal deliveries, obesity, and prostate surgery.

Educational Objective: Patients with diabetes mellitus frequently present with signs and symptoms of autonomic neuropathy, including overflow incontinence secondary to neurogenic bladder. Neurogenic bladder results in impaired autonomic sensation of bladder filling, with subsequent overflow incontinence, infrequent urination with incomplete bladder emptying, and a weakened urinary stream.

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6. A 71-year-old man is brought to the emergency department because of a 1-week history of increasingly severe pain in his left third toe. During the past 36 hours, he has not slept because of the pain. He has coronary artery disease, hypertension, and hyperlipidemia. Six years ago, he had a myocardial infarction. He has never undergone an operation. His medications are ramipril, labetalol, and aspirin. Acetaminophen and ibuprofen have provided no pain relief. He smoked one pack of cigarettes daily for 40 years but quit 6 years ago. He appears uncomfortable. His pulse is 84/min, and blood pressure is 170/90 mm Hg. A 4-cm, pulsatile, nontender mass is palpated in the left inguinal region. The left third toe is necrotic and exquisitely tender to palpation; there is no erythema or drainage. Pedal pulses are 2+ on the left. The remainder of the examination shows no abnormalities. A CT scan of the abdomen and pelvis is shown. In addition to intravenous analgesic therapy, which of the following is the most appropriate next step in management?

A) Piperacillin-tazobactam prescription
B) Placement of an Unna boot
C) Placement of a vena cava filter
D) Rivaroxaban therapy
E) Surgical arterial repair

Correct Answer: E.

Femoral artery aneurysms often involve the common femoral artery and are frequently associated with peripheral arterial disease. Risk factors include male sex, older age, tobacco use, hypertension, hyperlipidemia, and coronary artery disease, all of which are seen in this patient. Symptoms can vary, with some patients being asymptomatic. When present, however, symptoms include a pulsatile groin mass and vascular claudication. Femoral artery aneurysms can be complicated by acute limb ischemia, rupture, or distal embolism. Diagnosis often includes duplex ultrasonography of the groin or CT angiography. Symptomatic patients or those with large (≥ 3 cm) aneurysms should undergo surgical arterial repair. This patient with numerous cardiovascular risk factors presents with third toe ischemia most likely caused by thromboembolism in the setting of a pulsatile groin mass felt on physical examination. This pulsatile mass can be more clearly seen as an enlarged femoral artery with intraluminal

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pressure is 170/90 mm Hg. A 4-cm, pulsatile, nontender mass is palpated in the left inguinal region. The left third toe is necrotic and exquisitely tender to palpation; there is no erythema or drainage. Pedal pulses are 2+ on the left. The remainder of the examination shows no abnormalities. A CT scan of the abdomen and pelvis is shown. In addition to intravenous analgesic therapy, which of the following is the most appropriate next step in management?

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Incorrect Answers: A, B, C, and D.

Piperacillin-tazobactam prescription (Choice A) is used in the treatment of a variety of infections, such as pneumonia or intra-abdominal infections. While bacteremia can cause aneurysms, this is uncommon and more likely to lead to an infected pseudoaneurysm. This patient has no other signs of infection, making antibiotic therapy unnecessary.

Placement of an Unna boot (Choice B) is often used in the treatment of venous stasis ulcers. It is a compressive dressing that contains zinc oxide, which expedites healing. This would be inappropriate for this patient, as it would not treat the underlying cause of his necrotic toe.

Placement of a vena cava filter (Choice C) is used to prevent the embolization of deep venous thrombosis to the pulmonary vasculature in patients who have a contraindication to anticoagulation. This patient has no evidence of a deep venous thrombosis on physical examination. Rather, he has toe ischemia caused by a thromboembolism.

Rivaroxaban therapy (Choice D) is an anticoagulant used in the treatment of deep venous thrombosis, pulmonary embolism, and atrial fibrillation. While anticoagulation may be warranted in this patient, initiation should be delayed until after surgical arterial repair as it can increase surgical bleeding.

Educational Objective: Femoral artery aneurysms often present with vascular claudication and a pulsatile groin mass. Complications include acute limb ischemia, rupture, or distal embolism. Risk factors include male sex, older age, tobacco use, hypertension, hyperlipidemia, and coronary artery disease. Diagnosis is most frequently made with duplex ultrasonography or CT angiography. Treatment of symptomatic or large (≥ 3 cm) aneurysms consists of surgical arterial repair.

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7. A 37-year-old woman comes to the physician requesting assistance in applying for disability income. She fell at home 12 months ago and left her job at a day-care center because of subsequent low back pain. She received the diagnosis of major depressive disorder 8 months ago; her sleep, appetite, and mood have improved with citalopram therapy. Her only other medication is ibuprofen. She asks the physician to document a permanent and total disability on an application form for disability income so that she will have the financial resources to start college education on a full-time basis. She explains that she will become depressed again if she resumes her stressful job as a child-care provider. She does not appear to be in distress. She is 157 cm (5 ft 2 in) tall and weighs 68 kg (150 lb); BMI is 27 kg/m^2. Her temperature is 37°C (98.6°F), pulse is 64/min, and blood pressure is 108/60 mm Hg. Examination of the back shows no tenderness; range of motion of the lumbar spine is full. Neurologic examination shows no abnormalities. The physician will not fill out the form. In addition to informing the patient, which of the following is the most appropriate next step in management?

A) Reassure the patient that she will be all right
B) Confront the patient about requesting participation in fraud
C) Discuss options for the patient to work while pursuing an education
D) Explain that the patient is unlikely to have another depressive episode if she follows her medication regimen
E) Obtain an x-ray of the lumbosacral spine

Correct Answer: C.

Lying is viewed negatively in most philosophical systems because it exerts a morally negative effect on the person telling the lie, violates the autonomy of the person who is lied to, and undermines trust in society. In addition to its basic ethical value, truth-telling is a core value that underlies the physician's role as a healer and patient advocate. This patient is asking the physician to falsely certify a disability form. Falsifying a disability form is both unethical and is viewed as fraud by medical licensing authorities. This physician should decline to complete the form. However, the physician remains obligated to assist the patient to the greatest of their ability within the scope of ethical conduct. This physician should assist the patient by discussing options for her to work while pursuing an education.

Incorrect Answers: A, B, D, and E.

Reassuring the patient that she will be all right (Choice A) does not directly address the patient's desire to pursue an education.

Confronting the patient about requesting participation in fraud (Choice B) is likely to harm the patient-physician relationship and is not in the patient's best interest.

Explaining that the patient is unlikely to have another depressive episode if she follows her medication regimen (Choice D), while helpful for encouraging compliance with her medication, may not be accurate and may set a false expectation for the patient's course of treatment.

Obtaining an x-ray of the lumbosacral spine (Choice E) is unnecessary given her normal physical exam.

Educational Objective: Truth-telling is a core value that underlies the physician's role as a healer and patient advocate. Falsifying a disability form is both unethical and is viewed as fraud by medical licensing authorities. However, the physician remains obligated to assist the patient to the greatest of their ability within the scope of ethical conduct. This physician should assist the patient by discussing options for her to work while pursuing an education.

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8. A 67-year-old woman comes to the physician because of a 1-year history of a nonproductive cough and progressive shortness of breath with exertion. Her symptoms were not a problem at first, but she now has trouble walking her dog because of shortness of breath after walking one-half block. She has not had fever or any other symptoms. She has no history of serious illness and takes no medications. She does not smoke. She retired from her position as an executive secretary 5 years ago. Vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 92%. Examination shows no cyanosis. Fine, dry crackles are heard at both lung bases. Examination of the hands shows clubbing. There is no peripheral edema. A chest x-ray shows fine linear opacities in the lower third of the lungs bilaterally. A CT scan of the chest confirms an interstitial pattern. Pulmonary function tests show an FVC of 48% of predicted and a diffusion capacity of the lung for carbon monoxide of 55% of predicted. Which of the following is the most appropriate next step in diagnosis?

A) Measurement of serum ACE activity
B) Measurement of serum α_1-antitrypsin concentration
C) Serum antinuclear antibody assay
D) Bronchoalveolar lavage
E) Lung biopsy

Correct Answer: E.

This patient's presentation and diagnostic studies are consistent with a diagnosis of interstitial lung disease (ILD). A lung biopsy is the most appropriate next step given the severity of her symptoms and her significantly impaired pulmonary function, as well as a lack of apparent risk factors to direct the clinician toward an underlying cause. ILD encompasses a heterogeneous group of disorders that result in pulmonary fibrosis and progressively impaired lung function. Causes include various infections, occupational and environmental exposures, drug-induced pulmonary toxicity, radiation-induced lung injury, connective tissue disorders, hypersensitivity pneumonitis, and idiopathic disease. Patients classically present with progressive dyspnea and chronic nonproductive cough. Inspiratory crackles and hypertrophic osteoarthropathy (clubbing) may be present on physical examination. Chest imaging tends to show interstitial opacification in the periphery of the lungs, though radiologic patterns are dependent on the specific underlying cause.

Incorrect Answers: A, B, C, and D.

Measurement of serum ACE activity (Choice A) may support a diagnosis of sarcoidosis, which can cause ILD with progressive fibrosis. The test is not specific nor sensitive enough for diagnosis, and a lung biopsy is a more appropriate diagnostic test for this patient.

Measurement of serum α_1-antitrypsin concentration (Choice B) is not likely to aid in diagnosis in this case. Alpha-1 antitrypsin deficiency in the lungs causes chronic obstructive pulmonary disease with emphysema and bronchiectasis apparent on imaging.

Serum antinuclear antibody assay (Choice C) may be included as part of the diagnostic workup to evaluate for connective tissue disease as an underlying cause but is not specific nor sensitive enough to forego performing a lung biopsy.

Bronchoalveolar lavage (Choice D) is commonly performed in the workup of ILD, especially in patients presenting with rapid decompensation, hemoptysis, or a clinical picture suggestive of certain causes (particularly infections, sarcoidosis, hypersensitivity pneumonitis, or pulmonary Langerhans cell histiocytosis) as these conditions have specific findings on fluid analysis. In this case, the patient should undergo lung biopsy for more definitive diagnosis.

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Educational Objective: Interstitial lung disease (ILD) is an insidious disorder with numerous potential causes that typically presents with progressive dyspnea and nonproductive cough. The presence of ILD is best confirmed with CT imaging showing evidence of interstitial fibrosis. Definitive diagnosis of the underlying cause requires lung biopsy. For patients unable to tolerate biopsy or with milder symptoms, a treatment plan is often determined using clinical risk factors, history of exposures, radiographic patterns, and adjunct testing.

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✓ 9. A 2-year-old boy is brought to the physician for a follow-up examination 2 weeks after being treated for an ear infection. He has been treated for six episodes of acute otitis media and one episode of pneumonia since birth. Three months ago, he underwent placement of tympanostomy tubes. He currently takes no medications. He appears well. He is at the 75th percentile for length and 25th percentile for weight. Examination shows several 0.5- to 1-cm, firm, nontender, mobile lymph nodes in the anterior cervical chain. Tympanostomy tubes are in place bilaterally without discharge. Laboratory studies show:

Hemoglobin	12.5 g/dL
Hematocrit	37%
Leukocyte count	8100/mm^3
Platelet count	257,000/mm^3
Serum	
IgA	<7 mg/dL
IgG	720 mg/dL
IgM	75 mg/dL

Which of the following is the most appropriate next step in management?

A) Oral antibiotic therapy
B) Oral prednisone therapy
C) Intramuscular injection of immune globulin
D) Intravenous antithymocyte globulin
E) Intravenous immune globulin infusion
F) Bone marrow transplant
G) No intervention is indicated at this time

Correct Answer: G.

IgA deficiency is the most likely cause of this patient's recurrent infections. Selective IgA deficiency describes a decreased or absent concentration of circulating IgA with normal concentrations of IgG, and normal or increased concentrations of IgM. IgA is critical for immune health and functions by binding pathogen surface antigens, targeting them for opsonization, complement activation and phagocytosis, and coating mucosal surfaces to prevent colonization, adhesion, and invasion by pathogenic microorganisms. There is clinical heterogeneity in the severity of IgA deficiency. Some patients remain asymptomatic while others suffer from recurrent sinopulmonary infections or otitis media. In younger patients with severe deficiency, failure to thrive is common. Anaphylactic reactions to blood products such as plasma, which contain donor immunoglobulin, are classic but uncommon. Treatment of IgA deficiency is directed toward the treatment of symptomatic infections. Asymptomatic patients do not require specific monitoring.

Incorrect Answers: A, B, C, D, E, and F.

Oral antibiotic therapy (Choice A) may be considered as prophylaxis to reduce the frequency of infections in patients with selective IgA deficiency with more severe, recurrent infections. Despite widespread use, routine antibiotic prophylaxis in this population is not supported by high-quality evidence

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Correct Answer: G.

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Incorrect Answers: A, B, C, D, E, and F.

Oral antibiotic therapy (Choice A) may be considered as prophylaxis to reduce the frequency of infections in patients with selective IgA deficiency with more severe, recurrent infections. Despite widespread use, routine antibiotic prophylaxis in this population is not supported by high-quality evidence.

Oral prednisone therapy (Choice B) is not useful for the management of selective IgA deficiency, which results from a failure of B lymphocyte maturation rather than an autoimmune process. Prednisone therapy would exacerbate immunodeficiency and render this patient more susceptible to infection.

Intramuscular injection of immune globulin (Choice C) is incorrect. Immune globulin replacement is not routinely recommended for the treatment of selective IgA deficiency. Immune globulin replacement may be considered in patients with IgA deficiency who also demonstrate an associated IgG deficiency or other qualitative defects in antibody production. Immune globulin is administered subcutaneously or via intravenous infusion (Choice E).

Intravenous antithymocyte globulin (Choice D) results in depletion of circulating T lymphocytes and is useful for the prevention of acute rejection following solid organ transplantation. It plays no role in the management of selective IgA deficiency, which represents a failure of B lymphocyte maturation and would worsen immunodeficiency in this patient.

Bone marrow transplant (Choice F) is not necessary for the treatment of IgA deficiency. In general, the prognosis of selective IgA deficiency is excellent, and the risks of bone marrow transplantation generally exceed the potential benefits.

Educational Objective: Selective IgA deficiency describes a decreased or absent concentration of circulating IgA and presents with variable findings including asymptomatic patients, recurrent sinopulmonary infections or otitis media, failure to thrive, or anaphylactic reactions to blood products. Treatment of IgA deficiency is directed toward the treatment of symptomatic infections. Asymptomatic patients do not require specific monitoring.

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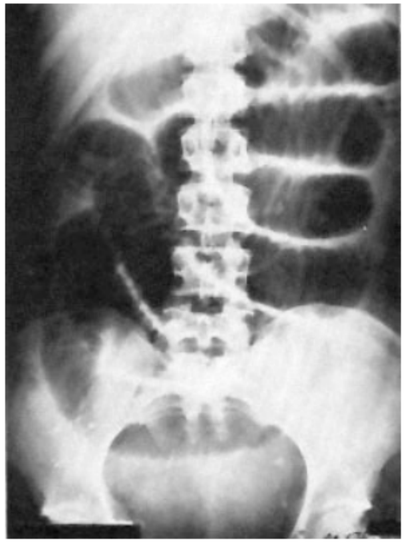
10. A 42-year-old woman comes to the physician because of nausea and vomiting and abdominal cramping and swelling over the past 12 hours. She takes an oral contraceptive. She underwent an appendectomy 5 years ago. Abdominal examination shows distention and moderate tenderness without guarding. An x-ray of the abdomen is shown. Which of the following is the most likely diagnosis?



A) Adynamic ileus
B) Mechanical obstruction of the small intestine
C) Pelvic abscess
D) Perforated abdominal viscus
E) Regional enteritis

Correct Answer: B.

Adhesions are the most common cause of small bowel obstruction (SBO) in patients with a prior history of intra-abdominal surgery. Obstruction of the small bowel occurs as a result of partial or complete blockage of the small bowel lumen from either intraluminal or extraluminal obstruction. It typically presents with nausea, vomiting, and abdominal pain and distention. Partial SBO allows a degree of continued flatus with diminished stooling, and complete SBO results in obstipation (no passage of stool or flatus). SBO has many potential causes, with formation of peritoneal adhesions following a previous intra-abdominal surgery being the most frequent. On physical examination, SBO typically presents with abdominal tenderness, distension, tympany to percussion, and borborygmi (high-pitched, hyperactive bowel sounds). Potential complications of SBO include bowel rupture and/or necrosis, which can result in sudden-onset peritoneal abdominal signs, such as rebound tenderness and guarding. Abdominal x-rays typically show dilated small bowel loops and can also have multiple air-fluid levels. Management requires bowel rest and intravenous hydration followed by surgical intervention if the obstruction does not reduce on its own. Partial SBO may resolve with monitoring, supportive care, and bowel rest, whereas complete obstruction or any complicated partial obstruction generally requires management through exploratory laparotomy.

Incorrect Answers: A, C, D, and E.

Adynamic ileus (Choice A) refers to intestinal hypomotility without a mechanical obstruction, most commonly occurring after surgery or in the setting of electrolyte abnormalities (eg, end-stage kidney disease resulting in hyperkalemia). This typically presents with diffuse small and large bowel dilatation. In a patient with prior abdominal surgery, a mechanical obstruction secondary to peritoneal adhesions is more likely.

Pelvic abscess (Choice C) can cause abdominal pain and fever but would not be visible on abdominal x-rays. This patient's severely dilated bowel loops on abdominal x-rays are more consistent with SBO.

Perforated abdominal viscus (Choice D) would cause peritonitis, guarding, and rigidity on abdominal examination. While SBOs can be complicated by necrosis and perforation, it is rare, and this patient does not show signs of perforation on examination. On imaging, perforation would show free intraperitoneal air.

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C) Pelvic abscess
D) Perforated abdominal viscus
E) Regional enteritis

Correct Answer: B.

Adhesions are the most common cause of small bowel obstruction (SBO) in patients with a prior history of intra-abdominal surgery. Obstruction of the small bowel occurs as a result of partial or complete blockage of the small bowel lumen from either intraluminal or extraluminal obstruction. It typically presents with nausea, vomiting, and abdominal pain and distention. Partial SBO allows a degree of continued flatus with diminished stooling, and complete SBO results in obstipation (no passage of stool or flatus). SBO has many potential causes, with formation of peritoneal adhesions following a previous intra-abdominal surgery being the most frequent. On physical examination, SBO typically presents with abdominal tenderness, distension, tympany to percussion, and borborygmi (high-pitched, hyperactive bowel sounds). Potential complications of SBO include bowel rupture and/or necrosis, which can result in sudden-onset peritoneal abdominal signs, such as rebound tenderness and guarding. Abdominal x-rays typically show dilated small bowel loops and can also have multiple air-fluid levels. Management requires bowel rest and intravenous hydration followed by surgical intervention if the obstruction does not reduce on its own. Partial SBO may resolve with monitoring, supportive care, and bowel rest, whereas complete obstruction or any complicated partial obstruction generally requires management through exploratory laparotomy.

Incorrect Answers: A, C, D, and E.

Adynamic ileus (Choice A) refers to intestinal hypomotility without a mechanical obstruction, most commonly occurring after surgery or in the setting of electrolyte abnormalities (eg, end-stage kidney disease resulting in hyperkalemia). This typically presents with diffuse small and large bowel dilatation. In a patient with prior abdominal surgery, a mechanical obstruction secondary to peritoneal adhesions is more likely.

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Perforated abdominal viscus (Choice D) would cause peritonitis, guarding, and rigidity on abdominal examination. While SBOs can be complicated by necrosis and perforation, it is rare, and this patient does not show signs of perforation on examination. On imaging, perforation would show free intraperitoneal air.

Regional enteritis (Choice E) can present with crampy abdominal pain, watery or bloody diarrhea, and abdominal distension. This patient's abdominal x-rays show diffuse small bowel loop dilation, making SBO more likely.

Educational Objective: Obstruction of the small bowel occurs from partial or complete blockage of the small bowel lumen, and typically presents with nausea, vomiting, and abdominal pain. Abdominal x-rays typically show dilated small bowel loops.

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11. A 22-year-old woman comes to the physician because of a 2-day history of severe shortness of breath. Over the past week, she has been taking ibuprofen for fever, chills, and muscle pain. She has no history of serious illness and takes no other medications. Her temperature is 38.4°C (101.1°F), pulse is 105/min and irregular, respirations are 28/min, and blood pressure is 70/50 mm Hg. Examination shows jugular venous distention. Crackles are heard throughout both lung fields. An S_3 gallop is heard. Pulses are decreased in the upper and lower extremities. An x-ray of the chest shows cardiomegaly and perihilar fluid. An ECG shows frequent premature ventricular contractions. Echocardiography shows cardiomegaly with normal valve function and an ejection fraction of 18%; her estimated cardiac output is 1.4 L/min (N=4–5). Which of the following is the most likely diagnosis?

A) Acute myocarditis
B) Acute pericarditis
C) Constrictive pericarditis
D) Ischemic cardiomyopathy
E) Pericardial tamponade
F) Superior vena cava syndrome

Correct Answer: A.

Severe acute myocarditis is the most likely diagnosis in this young patient. Myocarditis refers to inflammation of the myocardium. There are numerous causes, including infections (eg, coxsackievirus, parvovirus B19), toxins, medications (eg, doxorubicin), and connective tissue disease (eg, systemic lupus erythematosus, sarcoidosis). This patient has experienced a viral prodrome prior to presentation. Acute myocarditis has a broad clinical presentation, ranging from mild asymptomatic disease to severe heart failure. Patients are also at risk for arrhythmias as a result of disruption of the cardiac conduction system. Acute myocarditis may be difficult to distinguish from pericarditis and acute coronary syndrome as all of these disorders tend to present with chest pain, ECG changes, and increased serum cardiac biomarkers. Echocardiography can aid in making the diagnosis and guiding treatment. This patient's severe ejection fraction reduction is consistent with a disease process affecting the myocardium.

Incorrect Answers: B, C, D, E, and F.

Acute pericarditis (Choice B) can also present with dyspnea and chest pain in the context of fever and recent viral illness. Pericarditis typically displays characteristic ECG findings with widespread, noncontiguous ST elevations and PR depressions. A normal ejection fraction is also expected on echocardiography, and fluid may be observed in the pericardial space. Pericardial effusion may progress to pericardial tamponade (Choice E) if expansion of the myocardium and ventricular filling are impaired. Fluid will likely be visible in the pericardium on echocardiography as well as reduced ventricular movement.

Constrictive pericarditis (Choice C) typically presents with sharp chest pain that is aggravated by inspiration and alleviated by sitting and leaning forward. A coarse, sandpaper-like friction rub may be heard on cardiac auscultation. Physical examination findings also include fever, hypotension, tachycardia, pulsus paradoxus, and the Kussmaul sign (an increase in jugular venous distension during inspiration).

Ischemic cardiomyopathy (Choice D) is much more common in older patients unless there is a family history of early cardiac disease. It is most often caused by chronic coronary artery disease. Wall motion abnormalities are often noted on echocardiography corresponding to regions affected by ischemic damage.

Superior vena cava (SVC) syndrome (Choice F) is caused by obstruction of the SVC and subsequent venous congestion of the head, neck, and upper extremities. Patients typically develop distinct swelling of the face and neck, increased jugular venous pressure, upper extremity swelling, distended chest vein collaterals, and conjunctival edema.

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cardiomegaly and pericardial fluid. An ECG shows frequent premature ventricular contractions. Echocardiography shows cardiomegaly with normal valve function and an ejection fraction of 15%; her estimated cardiac output is 1.4 L/min (N=4–5). Which of the following is the most likely diagnosis?

A) Acute myocarditis
B) Acute pericarditis
C) Constrictive pericarditis
D) Ischemic cardiomyopathy
E) Pericardial tamponade
F) Superior vena cava syndrome

Correct Answer: A.

Severe acute myocarditis is the most likely diagnosis in this young patient. Myocarditis refers to inflammation of the myocardium. There are numerous causes, including infections (eg, coxsackievirus, parvovirus B19), toxins, medications (eg, doxorubicin), and connective tissue disease (eg, systemic lupus erythematosus, sarcoidosis). This patient has experienced a viral prodrome prior to presentation. Acute myocarditis has a broad clinical presentation, ranging from mild asymptomatic disease to severe heart failure. Patients are also at risk for arrhythmias as a result of disruption of the cardiac conduction system. Acute myocarditis may be difficult to distinguish from pericarditis and acute coronary syndrome as all of these disorders tend to present with chest pain, ECG changes, and increased serum cardiac biomarkers. Echocardiography can aid in making the diagnosis and guiding treatment. This patient's severe ejection fraction reduction is consistent with a disease process affecting the myocardium.

Incorrect Answers: B, C, D, E, and F.

Acute pericarditis (Choice B) can also present with dyspnea and chest pain in the context of fever and recent viral illness. Pericarditis typically displays characteristic ECG findings with widespread, noncontiguous ST elevations and PR depressions. A normal ejection fraction is also expected on echocardiography, and fluid may be observed in the pericardial space. Pericardial effusion may progress to pericardial tamponade (Choice E) if expansion of the myocardium and ventricular filling are impaired. Fluid will likely be visible in the pericardium on echocardiography as well as reduced ventricular movement.

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Educational Objective: Acute myocarditis should be suspected in a patient presenting with new, unexplained heart failure with reduced ejection fraction, especially in the setting of a recent viral prodrome. Other causes include toxins, medications, and autoimmune disease. Treatment is supportive and directed at the underlying cause.

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✓ 12. A study is conducted to determine if a hemoglobin A_{1c} greater than 15% predicts diabetic retinopathy. Results show that 88% of all patients without diabetic retinopathy had a hemoglobin A_{1c} below 15%. Which of the following is the most accurate interpretation of these results?

A) False-negative rate is 88%
B) False-positive rate is 88%
C) Negative predictive value is 88%
D) Positive predictive value is 88%
E) Power of the study design is 88%
F) Sensitivity is 88%
G) Specificity is 88%

Correct Answer: G.

Specificity describes the proportion of people who do not have the disease who test negative and is calculated as: true negatives / (true negatives + false positives). As specificity increases, the false positive rate decreases. A highly specific test allows the clinician and the patient to be confident that a positive test confirms the presence of disease. A test with poor specificity, if positive, does not provide strong evidence or confidence that the patient does, in fact, have the disease. In contrast, sensitivity is the ability of a test to detect a disease if it is present. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (Type 2 error). High sensitivity is useful in ruling out a disease. In the study described, a hemoglobin A_{1c} greater than 15% was present in 12% (false positive rate) and not present in 88% (true negative rate) of patients without diabetic retinopathy.

Incorrect Answers: A, B, C, D, E, and F.

False-negative (FN) rate (Choice A) represents the portion of patients who test negative but have the disease under study. This scenario provides insufficient information for the calculation of the FN rate.

False-positive (FP) rate (Choice B) represents the portion of patients who test positive but do not have the disease under study. In this scenario, this would represent patients with a hemoglobin A_{1c} greater than 15% who lack diabetic retinopathy (12%).

Negative predictive value (NPV) is 88% (Choice C) is incorrect. Negative predictive value is the likelihood that a person does not have a disease, given a negative test, and can be calculated as NPV = true negatives (TN)/(TN + FN). The results of this study do not allow for the calculation of NPV.

Positive predictive value (PPV) is 88% (Choice D) is incorrect. PPV is the likelihood that a person has a disease, given a positive test, and can be calculated as PPV = true positives (TP)/(TP + FP). The results of this study do not allow for the calculation of PPV.

Power of the study design (Choice E) is dependent upon the number of participants enrolled in the study. This scenario provides insufficient information to allow a calculation of the study's power.

Sensitivity (Choice F) describes the ability of a test to detect a disease if it is present. A negative result from a highly sensitive test indicates a low likelihood that the disease is present. Sensitivity is calculated by dividing TP by the sum of TP and FN, or TP/(TP + FN). In this scenario, true positives would represent patients who possess diabetic retinopathy who have a hemoglobin A_{1c} greater than

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C) Negative predictive value is 88%

D) Positive predictive value is 88%

E) Power of the study design is 88%

F) Sensitivity is 88%

G) Specificity is 88%

Correct Answer: G.

Specificity describes the proportion of people who do not have the disease who test negative and is calculated as: true negatives / (true negatives + false positives). As specificity increases, the false positive rate decreases. A highly specific test allows the clinician and the patient to be confident that a positive test confirms the presence of disease. A test with poor specificity, if positive, does not provide strong evidence or confidence that the patient does, in fact, have the disease. In contrast, sensitivity is the ability of a test to detect a disease if it is present. A test is described as sensitive if it has a high likelihood of disease detection, and therefore a low likelihood of a false negative (Type 2 error). High sensitivity is useful in ruling out a disease. In the study described, a hemoglobin A_{1c} greater than 15% was present in 12% (false positive rate) and not present in 88% (true negative rate) of patients without diabetic retinopathy.

Incorrect Answers: A, B, C, D, E, and F.

False-negative (FN) rate (Choice A) represents the portion of patients who test negative but have the disease under study. This scenario provides insufficient information for the calculation of the FN rate.

False-positive (FP) rate (Choice B) represents the portion of patients who test positive but do not have the disease under study. In this scenario, this would represent patients with a hemoglobin A_{1c} greater than 15% who lack diabetic retinopathy (12%).

Negative predictive value (NPV) is 88% (Choice C) is incorrect. Negative predictive value is the likelihood that a person does not have a disease, given a negative test, and can be calculated as NPV = true negatives (TN)/(TN + FN). The results of this study do not allow for the calculation of NPV.

Positive predictive value (PPV) is 88% (Choice D) is incorrect. PPV is the likelihood that a person has a disease, given a positive test, and can be calculated as PPV = true positives (TP)/(TP + FP). The results of this study do not allow for the calculation of PPV.

Power of the study design (Choice E) is dependent upon the number of participants enrolled in the study. This scenario provides insufficient information to allow a calculation of the study's power.

Sensitivity (Choice F) describes the ability of a test to detect a disease if it is present. A negative result from a highly sensitive test indicates a low likelihood that the disease is present. Sensitivity is calculated by dividing TP by the sum of TP and FN, or TP/(TP + FN). In this scenario, true positives would represent patients who possess diabetic retinopathy who have a hemoglobin A_{1c} greater than 15%. This scenario provides insufficient information for the calculation of sensitivity.

Educational Objective: Specificity describes the proportion of people who do not have the disease who test negative and is calculated as: true negatives / (true negatives + false positives). In the study described, a hemoglobin A_{1c} greater than 15% was present in 12% (false positive rate) and not present in 88% (true negative rate) of patients without diabetic retinopathy.

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13. A 13-year-old girl is brought to the physician by her mother because of a 3-day history of pain and pressure in her face, itchy eyes, and decreased hearing in both ears. She has not had fever, chills, muscle pain, or nausea. Acetaminophen has not relieved her symptoms. She takes no other medications. One year ago, she had a similar episode and was successfully treated with azithromycin therapy at an urgent care center, and her mother requests another prescription for azithromycin. The patient's two brothers have well-controlled asthma. Her vital signs are within normal limits. Examination shows a supple neck with a few shotty lymph nodes in the upper cervical chain. The conjunctivae have a cobblestone appearance. The inferior nasal turbinates are edematous. The tympanic membranes are injected bilaterally. There is moderate mucus in the posterior pharynx. The tonsils are not enlarged. The lungs are clear to auscultation. Which of the following is the most appropriate next step in management?

A) CT scan of the head
B) MRI of the sinuses
C) Ceftriaxone therapy
D) Loratadine therapy
E) Prednisone therapy

Correct Answer: D.

Allergic rhinitis is a common cause of upper respiratory infection-like symptoms in children, teens, and adults. Frequent allergens include pollen, dust mites, mold, and animal dander. It commonly presents with rhinorrhea, sneezing, and cough. It may be associated with allergic conjunctivitis, as well, which presents with itchy, watering eyes. Physical examination may disclose inflamed nasal turbinates, “cobblestoning” of the posterior pharynx and upper eyelids, retracted and injected tympanic membranes, and infraorbital darkening. Chronic nasal obstruction can lead to impairment of sinus drainage, which can lead to the development of sinusitis. Bacterial inoculation can also occur, leading to bacterial sinusitis with fever, facial pain, purulent rhinorrhea, and cough. Risk factors include a personal or family history of atopy, early exposure to allergens, being the firstborn child, and childhood use of antibiotics. The diagnosis is clinical, and treatment includes a second-generation antihistamine, as well as a glucocorticoid nasal spray, to reduce inflammation and allow appropriate nasal and sinus drainage. This patient presents with facial pain likely caused by sinus obstruction in the setting of nasal inflammation, further evidenced by her injected tympanic membranes with reduced hearing. However, she has no signs of bacterial sinusitis, such as fever or purulent nasal discharge. Thus, in conjunction with the allergic conjunctivitis she is experiencing, the most likely cause of her symptoms is allergic rhinitis, and she should be treated with an oral antihistamine such as loratadine.

Incorrect Answers: A, B, C, and E.

CT scan of the head (Choice A) is not necessary to make the clinical diagnosis of allergic rhinitis in this patient. CT scan can be used to look for intracranial abnormalities that may be causing facial pain or to assist in the diagnosis of bacterial sinusitis if the diagnosis is unclear. This patient has clear signs of an allergic cause, thus making treatment with loratadine a more appropriate next step.

MRI of the sinuses (Choice B) may be used in the evaluation of recurrent or chronic sinusitis. It can be especially useful in the diagnosis of sinus tumors or fungal infections. This patient has uncomplicated allergic sinusitis, making an MRI unnecessary.

Ceftriaxone therapy (Choice C) is used in the treatment of a variety of infections, such as community-acquired pneumonia, bacterial meningitis, and acute otitis media. This patient’s itchy, watery eyes, edematous turbinates, and injected tympanic membranes are more consistent with an allergic cause than an infectious cause.

Prednisone therapy (Choice E) is often prescribed for the treatment of autoimmune and inflammatory disorders. While it may reduce the inflammation associated with this patient’s allergic rhinitis, prednisone has a variety of adverse effects and would not be the first-line therapy. Her initial treatment should include an antihistamine.

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Incorrect Answers: A, B, C, and E.

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Prednisone therapy (Choice E) is often prescribed for the treatment of autoimmune and inflammatory disorders. While it may reduce the inflammation associated with this patient's allergic rhinitis, prednisone has a variety of adverse effects and would not be the first-line therapy. Her initial treatment should include an antihistamine.

Educational Objective: Allergic rhinitis commonly presents with rhinorrhea, sneezing, cough, and nasal congestion, the latter of which can lead to sinusitis with facial pain and obstructed tympanic membranes with reduced hearing. It is commonly associated with allergic conjunctivitis and asthma. Physical examination will show inflamed nasal turbinates, "cobblestoning" of the posterior pharynx and upper eyelids, retracted and injected tympanic membranes, and infraorbital darkening. Treatment includes a second-generation antihistamine and a glucocorticoid nasal spray.

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✓ 14. A 76-year-old woman is scheduled to undergo right knee arthroscopy at an ambulatory surgery center. Before the procedure begins, the surgical team confirms the identity of the patient, the procedure being performed, the side and site of the procedure, the patient's position, and the availability of needed equipment. The procedure is then completed without complications, and the patient is discharged home 4 hours later. Which of the following is most likely increased at this center as a result of the pre-procedure actions of the surgical team?

A) Efficiency
B) Patient satisfaction
C) Patient-centered care
D) Reliability

Correct Answer: D.

Despite best efforts, surgical reliability remains prone to errors, including performance of incorrect procedures or surgery performed at the wrong site or on the wrong patient. The Joint Commission Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery was developed to reduce such errors and improve surgical reliability. Steps include preoperative verification of the patient's identity, the procedure to be performed, and the surgical site. The patient should be involved in the verification process whenever possible, and any discrepancies or questions should be addressed. The use of a checklist can assist in ensuring a standardized verification process. The surgical site should be marked by the surgeon who will perform the procedure, and the surgical mark should be both unambiguous and positioned such that it will be visible after the surgical drape is placed. Additionally, a final verification "time out" should be performed prior to induction of anesthesia to verify the patient's identity, the procedure, and the surgical site.

Incorrect Answers: A, B, and C.

Efficiency (Choice A) is incorrect. Preprocedure verification requires several minutes and slightly reduces efficiency. This loss of efficiency is more than offset by the benefits of increasing reliability and reducing the risk for performing incorrect procedures.

Patient satisfaction (Choice B) and patient-centered care (Choice C) are important components of high-quality health care, but are impacted less directly by preoperative verification procedures, which have their most direct impact on reliability.

Educational Objective: The Joint Commission Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery was developed to reduce surgical errors and improve surgical reliability. Preprocedure actions include preoperative verification of the patient's identity, the procedure to be performed, and the surgical site.

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15. Immediately after extubation following a total thyroidectomy, a 72-year-old woman has stridor and shortness of breath. She has a history of transient ischemic attacks and coronary artery disease. Her only medication is aspirin. She appears to be in distress and is gasping for air. Her pulse is 100/min, respirations are 35/min, and blood pressure is 170/100 mm Hg. Examination shows an intact surgical incision and no ecchymosis. Breath sounds are decreased bilaterally. Arterial blood gas analysis on 40% oxygen by face mask shows:

pH	7.3
Pco_2	60 mm Hg
Po_2	200 mm Hg
O_2 saturation	99%

Which of the following is the most likely diagnosis?

A) Cerebral infarction
B) Extrinsic tracheal compression
C) Laryngeal nerve paralysis
D) Pulmonary embolism
E) Tension pneumothorax

Correct Answer: C.

Thyroidectomy is a common surgical procedure, often used in the management of hyperthyroidism, thyroid cancer, and goiter. The thyroid gland is situated anterior to the trachea and consists of two lobes that are connected by a smaller isthmus. The thyroid is located near a variety of vascular and neurologic structures. The recurrent laryngeal nerves run posteriorly to the two lobes bilaterally. They provide muscle innervation for both abduction and adduction of the vocal cords, as well as sensation to the region below the glottis. Special care is taken to identify these nerves during thyroidectomy to avoid nerve injury, often with direct intraoperative nerve monitoring. Unilateral recurrent laryngeal nerve paralysis can lead to voice hoarseness caused by the inability to abduct the vocal cord on one side, whereas bilateral paralysis can lead to airway obstruction as both vocal cords remain in a medial position. This patient has respiratory distress with audible stridor, indicating an upper airway obstruction, the likelihood of which is further reinforced by decreased breath sounds bilaterally caused by poor air movement through the obstruction. Given the onset of this patient's symptoms immediately after surgery, the most likely cause of this presentation is bilateral recurrent laryngeal nerve paralysis leading to vocal cord paralysis and airway obstruction.

Incorrect Answers: A, B, D, and E.

Cerebral infarction (Choice A) would most likely lead to unilateral motor weakness or sensory changes. It would be unlikely to cause respiratory distress with stridor as a result of laryngeal nerve dysfunction in the absence of any other symptoms. Although this patient has a history of transient ischemic attacks, her symptoms are most consistent with laryngeal nerve paralysis sustained during the procedure.

Extrinsic tracheal compression (Choice B) can lead to airway compromise following a thyroidectomy. This is most commonly caused by surgical bleeding that leads to an expanding hematoma in an enclosed space, thereby compressing the trachea. This patient has no evidence of hematoma on examination, making this an unlikely cause of her symptoms.

Pulmonary embolism (Choice D) can cause the acute onset of dyspnea, tachypnea, tachycardia, and, occasionally, hemoptysis. However, pulmonary emboli are more likely to present several days after surgery, rather than immediately following extubation. Additionally, pulmonary emboli are not associated with the stridor or decreased bilateral breath sounds exhibited by this patient.

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Tension pneumothorax (Choice E) commonly presents with dyspnea, hypoxia, tachycardia, hypotension, tracheal deviation, and unilaterally absent breath sounds. It can rapidly lead to cardiac arrest and death if not identified. This patient has bilateral breath sounds and is hypertensive, making a tension pneumothorax unlikely.

Educational Objective: The recurrent laryngeal nerves are responsible for providing the majority of motor innervation to the muscles of the larynx, as well as the sensation to the tissues below the glottis. These nerves course posterior to the thyroid bilaterally, putting them at risk for sustaining injury during a thyroidectomy. This is often avoided by using direct intraoperative nerve monitoring. However, if inadvertently injured, unilateral injury will lead to voice hoarseness while bilateral injury can lead to severe upper airway obstruction.

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16. A 46-year-old man with hypertension comes to the physician for a routine examination. When the physician enters the room, the patient says the office staff were talking about him in the waiting room. The patient has declined antihypertensive therapy in the past; today, he declines it again, saying "it does not matter because the world is going to end soon." He does not drink alcohol or use illicit drugs. He lives alone and has minimal contact with his family. He says he has one friend and spends his free time playing video games. He works at home for an accounting firm. He appears fearful and older than his stated age. He wears an overcoat and woolen hat although the outside temperature is 80°F. His pulse is 80/min and regular, and blood pressure is 140/98 mm Hg. Limited physical examination shows no abnormalities. On mental status examination, he has a euthymic mood and odd affect. He makes minimal eye contact with the physician and appears anxious when questioned. He says he has not had anxiety or changes in mood. Cognition is intact, and answers to questions are appropriate. His thought process is linear. He reports no hallucinations. Results of laboratory studies are within the reference ranges. Which of the following is the most likely diagnosis?

A) Autism spectrum disorder
B) Delusional disorder
C) Oppositional defiant disorder
D) Schizophrenia
E) Schizotypal personality disorder

Correct Answer: E.

Schizotypal personality disorder is one of the cluster A (the odd or eccentric cluster) personality disorders according to the DSM-5. Personality disorders are persistently maladaptive ways of relating to the self and to society that typically appear by early adulthood. Schizotypal personality disorder is characterized by odd behavior and thinking, and a constricted affect. Patients with schizotypal personality disorder may have strange, overly metaphorical or magical thinking, though they fluctuate in the degree of their conviction about these beliefs, which differentiates these beliefs from the fixed delusions of schizophrenia. The strange beliefs may also manifest as an eccentric appearance. Patients may experience somatosensory illusions or other abnormal perceptions. Patients with schizotypal personality disorder may appear to lack interest in cultivating relationships and, as a result of an inability to interpret others' motivations, may be deeply distrustful and anxious around others.

Incorrect Answers: A, B, C, and D.

Autism spectrum disorder (Choice A) is a neurodevelopmental disorder characterized by a broad range of signs and symptoms involving restricted and repetitive patterns of behavior or activities, difficulties with social interaction, and difficulties with communication. It typically manifests during childhood by age 1 or 2 years. This patient's eccentric appearance and beliefs are more consistent with schizotypal personality disorder.

Delusional disorder (Choice B) is characterized by the presence of one or more delusions (ie, fixed, false beliefs) for a month or longer without other psychotic symptoms. Delusional disorder is not characterized by an eccentric appearance, social indifference, or constricted affect.

Oppositional defiant disorder (Choice C) manifests in children as a persistent pattern of angry mood, defiant behavior, and vindictiveness that causes distress and impaired functioning.

Schizophrenia (Choice D) is characterized by at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, alogia) during a period of at least 6 months. This patient does not experience hallucinations and does not display disorganized thoughts, speech, or behavior.

Educational Objective: Schizotypal personality disorder manifests as an enduring pattern of strange or eccentric beliefs and behaviors, social detachment or suspiciousness, and abnormal perceptual

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fearful and older than his stated age. He wears an overcoat and woolen hat although the outside temperature is 80°F. His pulse is 80/min and regular, and blood pressure is 140/98 mm Hg. Limited physical examination shows no abnormalities. On mental status examination, he has a euthymic mood and odd affect. He makes minimal eye contact with the physician and appears anxious when questioned. He says he has not had anxiety or changes in mood. Cognition is intact, and answers to questions are appropriate. His thought process is linear. He reports no hallucinations. Results of laboratory studies are within the reference ranges. Which of the following is the most likely diagnosis?

A) Autism spectrum disorder
B) Delusional disorder
C) Oppositional defiant disorder
D) Schizophrenia
E) Schizotypal personality disorder

Correct Answer: E.

Schizotypal personality disorder is one of the cluster A (the odd or eccentric cluster) personality disorders according to the DSM-5. Personality disorders are persistently maladaptive ways of relating to the self and to society that typically appear by early adulthood. Schizotypal personality disorder is characterized by odd behavior and thinking, and a constricted affect. Patients with schizotypal personality disorder may have strange, overly metaphorical or magical thinking, though they fluctuate in the degree of their conviction about these beliefs, which differentiates these beliefs from the fixed delusions of schizophrenia. The strange beliefs may also manifest as an eccentric appearance. Patients may experience somatosensory illusions or other abnormal perceptions. Patients with schizotypal personality disorder may appear to lack interest in cultivating relationships and, as a result of an inability to interpret others' motivations, may be deeply distrustful and anxious around others.

Incorrect Answers: A, B, C, and D.

Autism spectrum disorder (Choice A) is a neurodevelopmental disorder characterized by a broad range of signs and symptoms involving restricted and repetitive patterns of behavior or activities, difficulties with social interaction, and difficulties with communication. It typically manifests during childhood by age 1 or 2 years. This patient's eccentric appearance and beliefs are more consistent with schizotypal personality disorder.

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Oppositional defiant disorder (Choice C) manifests in children as a persistent pattern of angry mood, defiant behavior, and vindictiveness that causes distress and impaired functioning.

Schizophrenia (Choice D) is characterized by at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, alogia) during a period of at least 6 months. This patient does not experience hallucinations and does not display disorganized thoughts, speech, or behavior.

Educational Objective: Schizotypal personality disorder manifests as an enduring pattern of strange or eccentric beliefs and behaviors, social detachment or suspiciousness, and abnormal perceptual experiences such as illusions. Social indifference distinguishes schizotypal disorder from DSM-5 cluster B and C personality disorders, while eccentric beliefs and behavior differentiate the disorder from the other cluster A personality disorders.

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17. A 4-year-old girl is brought to the office by her mother because of a 1-week history of vaginal itching. The mother says her daughter is scratching her vaginal area frequently and the area appears irritated. The patient has not had fever, pain with urination, or urinary frequency. She has been toilet-trained for 1 year. The mother is not concerned about sexual abuse. When questioned alone, the patient says that no one has touched her inappropriately. Examination shows erythema of the vaginal area. There is no vaginal discharge, foul odor, bleeding, tears, or ecchymoses. Which of the following is the most appropriate next step in management?

A) Begin antibiotic therapy
B) Begin antifungal therapy
C) Order evaluation by child protective services
D) Recommend that the patient switch to cotton underwear and avoid bubble baths
E) Schedule gynecologic examination

Correct Answer: D.

Vulvovaginitis presents with vaginal itching and erythema, and it can have a variety of causes. When present in a prepubertal child, a careful investigation into the possibility of sexual abuse should occur. Other causes of vulvovaginitis in a child include poor hygiene, foreign bodies (especially toilet paper), occlusive clothing, and exposure to irritants. Less common causes include infections such as pinworms, *Streptococcus pyogenes*, and *Escherichia coli*. Foreign bodies and infections are frequently associated with foul odor and vaginal discharge. Initial treatment includes hygienic improvement and the avoidance of irritants, such as recommending that the patient switch to cotton underwear and avoid bubble baths, which is the most appropriate next step in management of this patient's nonspecific vulvovaginitis. If the vulvovaginitis is recurrent or does not respond to conservative measures, further evaluation with vaginal cultures may be appropriate.

Incorrect Answers: A, B, C, and E.

Begin antibiotic therapy (Choice A) and begin antifungal therapy (Choice B) are not the most appropriate next step. This patient has nonspecific vulvovaginitis with no signs of infection such as foul odor or vaginal discharge. It is most appropriate to begin with conservative management that decreases exposure to irritants.

Order evaluation by child protective services (Choice C) would be inappropriate. Sexually transmitted infections can cause vulvovaginitis, and children presenting with this pathology should be carefully evaluated for other signs of physical or sexual abuse. However, there is no clinical evidence of abuse.

Schedule gynecologic examination (Choice E) is not necessary. This patient has nonspecific vaginitis, likely caused by exposure to irritants. Gynecologic examination is frequently avoided in children of her age unless the diagnosis remains unclear.

Educational Objective: Vulvovaginitis in a prepubertal child presents with vaginal itching and erythema, as well as foul odor or vaginal discharge based on the cause. Causes include poor hygiene, foreign bodies, occlusive clothing, exposure to irritants, and infection. Children presenting with vulvovaginitis should be carefully evaluated for signs and symptoms of physical or sexual abuse. Treatment of nonspecific vulvovaginitis is initially conservative, with recommendations to improve hygiene and limit exposure to irritants such as bubble baths or synthetic materials.

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18. An 87-year-old man comes to the physician because of a 2-day history of visual changes in his right eye. He notices that the lines of his daily crossword puzzle look curved, and the blinds in his apartment appear wavy. He wears magnifying lenses for reading. There is no pain in his eye, no photophobia, and no history of trauma to the area. He had cataract removal from the right eye 5 years ago. There is no history of serious illness. On examination, visual acuity is 20/200 in his right eye and 20/100 in his left eye. The right pupil is irregular, but it is reactive to light. The left pupil is round and reactive. This examination finding is unchanged since his cataract operation. Palpation of both globes through closed eyelids shows no abnormalities. His lenses appear clear. Which of the following is the most appropriate next step in diagnosis?

A) Dilated funduscopic examination
B) Slit-lamp examination
C) Visual field testing
D) CT scan of the head
E) Temporal artery biopsy

Correct Answer: A.

Age-related macular degeneration (AMD) is an acquired retinal degeneration characterized by dysfunction of the retinal pigment epithelium and accumulation of macular drusen, the hallmark of AMD. Drusen represent yellow, subretinal, extracellular deposits of lipoproteinaceous material. The underlying cause is not completely understood, but a combination of environmental and multiple genetic risk factors is likely involved, including genes associated with complement regulation and autophagy. AMD is common and is a leading cause of nonreversible blindness in developed countries. Early stages of the disease may be asymptomatic or characterized by insidious blurring or metamorphopsia (a visual distortion in which straight lines appear curved). In advanced stages, profound vision loss may result from retinal geographic atrophy or choroidal neovascularization with associated macular edema, exudation, or hemorrhage. Risk factors for AMD include age, smoking, and genetics. The diagnosis is established by a dilated funduscopic examination to evaluate the retina. Antioxidant and vitamin supplementation are helpful for delaying the progression of nonexudative (dry) AMD, while exudative (wet) AMD is treated with intravitreal injections of monoclonal antibodies against vascular endothelial growth factor.

Incorrect Answers: B, C, D, and E.

Slit-lamp examination (Choice B) is a method for examining ocular structures under high magnification. This technique may be used to examine structures within the anterior segment of the eye, such as the cornea, iris, or lens, or within the posterior segment (including the retina and optic nerve), usually as part of a dilated funduscopic examination.

Visual field testing (Choice C) is a method for detecting visual scotomas or visual field loss. It is most useful in the diagnosis of glaucoma and other disorders of the optic nerve, such as idiopathic intracranial hypertension. It plays little role in the diagnosis of AMD.

CT scan of the head (Choice D) is useful for identification of orbital pathology, including mass lesions and fractures of the orbital bones. While this patient's irregular right pupil may suggest an orbital mass lesion, it more likely represents postsurgical changes to the pupil following cataract surgery. Orbital masses are typically accompanied by other signs and symptoms, such as proptosis, ptosis, or diplopia. CT scan of the head plays no role in the diagnosis of AMD.

Temporal artery biopsy (Choice E) is useful for the diagnosis of temporal arteritis, a small-vessel vasculitis with a predilection for the arteries of the head and neck that may lead to acute, irreversible blindness. Temporal arteritis typically presents in patients older than age 65 with constitutional symptoms of fever, chills, and weight loss, as well as scalp tenderness, new headaches, jaw claudication, and chest pain. Temporal arteritis may present concomitantly with polymyalgia rheumatica. Suspicion of temporal arteritis should lead to the immediate initiation of high-dose corticosteroid therapy.

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B) Slit-lamp examination
C) Visual field testing
D) CT scan of the head
E) Temporal artery biopsy

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Incorrect Answers: B, C, D, and E.

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Educational Objective: Age-related macular degeneration (AMD) is an acquired retinal degeneration characterized by dysfunction of the retinal pigment epithelium and accumulation of macular drusen. Age is the most important risk factor for AMD, along with smoking and genetics. Early stages of the disease may be asymptomatic or characterized by insidious blurring or metamorphopsia. In advanced stages, vision loss may result from retinal geographic atrophy or choroidal neovascularization with macular edema, exudation, or hemorrhage. The diagnosis is established with a dilated funduscopic examination.

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✓ 19. A 27-year-old woman comes to the office for a health maintenance examination. She says she feels well. She has no history of serious illness and takes no medications. Vital signs are within normal limits. Examination shows no lymphadenopathy. A 2-cm nodule is palpated in the left lobe of the thyroid gland. The remainder of the examination shows no abnormalities. Results of laboratory studies, including measurement of serum thyroid-stimulating hormone concentration, are within the reference ranges. Which of the following is the most appropriate next step in management?

A) ^{131}I scintigraphy
B) Levothyroxine therapy and reexamination in 6 weeks
C) Reexamination of the thyroid gland in 6 months
D) Repeat measurement of serum thyroid-stimulating hormone concentration in 6 weeks
E) Ultrasonography-guided fine-needle aspiration biopsy

Correct Answer: E.

Discovery of a palpable thyroid mass by a patient at home or during a routine clinical visit is a common occurrence, and the diagnostic workup focuses on ruling out malignancy. Risk factors for thyroid malignancy include young age (the prevalence of benign thyroid nodules increases with age), radiation exposure to the head or neck, and a family history of thyroid cancer or associated congenital neoplastic syndrome (eg, multiple endocrine neoplasia, type 2). All patients with a new nodule should be evaluated with serum TSH measurement and thyroid ultrasonography. Ultrasonography-guided fine-needle aspiration biopsy can be performed at the same time, which is recommended for patients with risk factors for malignancy or for nodules with concerning ultrasound features. Subsequent workup and management are dependent upon the results of the TSH measurement, ultrasound characteristics of the nodule, and biopsy results.

Incorrect Answers: A, B, C, and D.

^{131}I scintigraphy (Choice A), also known as a radioactive iodine uptake scan, is recommended if the TSH concentration is low, indicating primary hyperthyroidism, as hyperfunctioning nodules are rarely malignant and do not require fine-needle aspiration biopsy. The uptake pattern guides further management.

Levothyroxine therapy and reexamination in 6 weeks (Choice B), reexamination of the thyroid gland in 6 months (Choice C), and repeat measurement of serum thyroid-stimulating hormone concentration in 6 weeks (Choice D) are not appropriate management options given the importance of ruling out malignancy, especially in a young patient.

Educational Objective: Palpable thyroid masses are a common incidental discovery on physical examination and imaging. Diagnostic workup is necessary to exclude malignancy. All patients should have their TSH concentration checked and ultrasonography of the thyroid gland performed. Fine-needle aspiration biopsy is indicated if the TSH is normal or increased, the patient has risk factors for thyroid malignancy, or the nodule has concerning features on ultrasonography.

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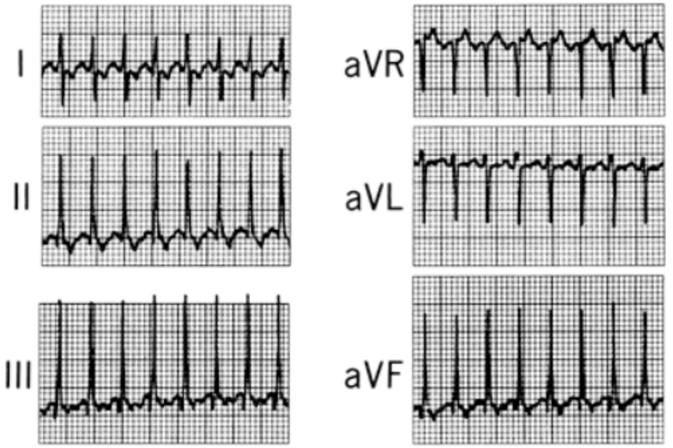
20. A 17-year-old boy is brought to the emergency department by his mother because of a 20-minute episode of severe chest pain and sweating that started 1 hour ago while he was watching television. On arrival, he is alert and repeatedly expresses concern that something is "very wrong." He reports that during the episode, his heart was "pounding," he felt short of breath, and he was sure he was having a heart attack and was going to die. One month ago, he had a similar episode that occurred in the evening 30 minutes after his high school football practice. At that time, results of laboratory studies and an ECG obtained in the emergency department showed no abnormalities. After the initial episode, he quit the football team, and he has continued to limit his physical activity because he is afraid of bringing on another episode. He reports no insomnia or changes in appetite. His mother states that he was diagnosed with an innocent heart murmur at the age of 6 months, but it has not been noted on examinations since the age of 1 year. His paternal grandfather died of a myocardial infarction 3 years ago at the age of 68 years. The patient takes no medications. He does not smoke cigarettes, drink alcohol, or use illicit drugs. He performs well in school. He is 180 cm (5 ft 11 in) tall and weighs 73 kg (161 lb); BMI is 23 kg/m^2. His temperature is 37.0°C (98.6°F), and blood pressure is 130/83 mm Hg. No murmurs are heard on cardiac examination. The remainder of the examination shows no abnormalities. ECG is shown. Which of the following is the most likely diagnosis?



A) Acute stress disorder
B) Delusional disorder
C) Generalized anxiety disorder
D) Hypertrophic cardiomyopathy
E) Idiopathic recurrent pericarditis
F) Panic disorder
G) Paroxysmal supraventricular tachycardia

Correct Answer: G.

Paroxysmal supraventricular tachycardia (PSVT) refers to an abnormally rapid heart rate and rhythm originating from above the ventricles, typically with a regular rhythm and a narrow QRS complex on ECG. Patients with PSVT can manifest with acute symptoms of lightheadedness, palpitations, diaphoresis, and syncope. PSVT is typically caused by structural defects in the His-Purkinje system causing a re-entrant pathway, such as in Wolff-Parkinson-White syndrome, atrioventricular nodal tachycardia, or atrioventricular nodal re-entrant tachycardia. Or PSVT may be provoked by alcohol, nicotine, caffeine, or psychological stress. In patients who are hemodynamically unstable, cardioversion is indicated in the management of narrow complex tachycardia. For patients who are hemodynamically stable, attempts can be made to terminate the narrow complex tachyarrhythmia by vagal maneuvers (eg, ice or cold water over the face), or with adenosine or nodal blocking agents.

Incorrect Answers: A, B, C, D, E, and F.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts, hyperarousal, dissociation, avoidance, and/or depressed mood within 1 month of a traumatic event such as a life-threatening motor vehicle collision.

Delusional disorder (Choice B) features the presence of one or more delusions for 1 month or longer with no other psychotic symptoms such as hallucinations, thought disorder, psychosomatic symptoms, or mood disorder. Delusions are characterized by a persistent idea or belief that can have undue influence on a patient's life.

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D) Hypertrophic cardiomyopathy

E) Idiopathic recurrent pericarditis

F) Panic disorder

G) Paroxysmal supraventricular tachycardia

Correct Answer: G.

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Generalized anxiety disorder (Choice C) features excessive and persistent worrying that may be associated with sympathetic hyperactivity.

Hypertrophic cardiomyopathy (Choice D) classically presents with dyspnea, chest pain, syncope, or sudden cardiac death in an exercising young athlete with a potential family history of a similar event. Physical examination findings include a systolic murmur loudest in the lower left sternal border, which is quieter with increased preload and afterload, and a laterally displaced point of maximal impulse.

Idiopathic recurrent pericarditis (Choice E) refers to repeated episodes of pericarditis, with a repeat episode recurring about 6 weeks after the resolution of the prior episode. Pericarditis classically presents with substernal chest pain that is often pleuritic, worsens when lying down, and improves with leaning forward. On examination, pericarditis discloses a diastolic friction rub, described as a harsh sound heard in diastole.

Panic disorder (Choice F) is characterized by recurrent panic attacks that are unexpected and associated with worry about future panic attacks or avoidance of panic attack triggers. Panic attacks feature acute fear or anxiety that peaks within minutes and is associated with symptoms of sympathetic hyperactivity, such as tachycardia, heart palpitations, sweating, and trembling along with shortness of breath, chest pain, dizziness, gastrointestinal distress, and paresthesias.

Educational Objective: Paroxysmal supraventricular tachycardia (PSVT) refers to an abnormally rapid heart rate and rhythm originating from above the ventricles, typically with a narrow QRS complex on ECG. PSVT is typically caused by structural defects in the His-Purkinje system causing a re-entrant pathway.

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21. A 72-year-old man comes to the physician for a routine health maintenance examination. Abdominal examination shows a nontender, pulsatile mass in the epigastrium. Abdominal ultrasonography shows a 7.2-cm aneurysm. The physician reviews several studies of patients with abdominal aneurysms that are greater than 7 cm in size. The rupture rate is estimated to be 20% per year. Following rupture of an abdominal aneurysm, one half of patients die before reaching a hospital. For patients who do reach a hospital, the perioperative mortality rate is approximately 50%. The mortality rate for patients who undergo elective repair of an aneurysm is 5%. After discussing the risks and benefits of surgical repair of the aneurysm, the patient decides not to undergo an operation. Which of the following best represents this patient's risk for mortality from rupture of the aneurysm during the next year?

A) 5%
B) 10%
C) 15%
D) 20%
E) 50%

Correct Answer: C.

Correct statistical interpretation is important for conveying accurate information to patients. In this scenario, a study demonstrates a 20% annual rate of rupture for abdominal aortic aneurysms greater than 7 cm in diameter. Among ruptured aneurysms, the study identified a 50% mortality rate prior to hospital evaluation, in addition to a 50% perioperative mortality rate among the remaining 50% of patients who do reach a hospital. In effect, 75% (50% prehospital, and half of the remaining 50% who survived to surgery) of those who experience aneurysmal rupture will die; however, the risk for rupture is 20% per year, representing a 15% overall risk of mortality from aneurysmal rupture in a given year. This is represented by the calculation: (1*0.5 (prehospital risk of death) + 1*0.5*0.5 (perioperative mortality))*0.2 (annual risk for rupture) = 0.15.

Incorrect Answers: A, B, D, and E.

5% (Choice A) is incorrect, and represents an incorrect mathematical calculation: 0.20 x 0.5 x 0.5 = 0.05, or 5%.

10% (Choice B) is incorrect, and represents an incorrect mathematical calculation: 0.20 x 0.5 = 0.1, or 10%. This calculation fails to include perioperative mortality.

20% (Choice D) is incorrect, and represents the annual rate of aneurysmal rupture.

50% (Choice E) is incorrect, and represents the mortality rate prior to hospital admission among patients with ruptured aneurysms.

Educational Objective: Correct statistical interpretation is important for conveying accurate information to patients. In this scenario, 75% of those who experience aneurysmal rupture will die, representing a 15% overall risk of mortality from aneurysmal rupture in a given year.

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22. A 58-year-old man with an 8-year history of schizoaffective disorder, manic type, is brought to the clinic for a follow-up examination. Two weeks ago, he was hospitalized for a manic episode. Risperidone was added to his medication regimen; the dosage was increased to the maximum recommended prior to discharge. At that time, neurologic examination showed mild cogwheel rigidity. There was no evidence of tremors. Muscle strength was 5/5. He has no other history of serious medical or psychiatric illness. His other medications are valproic acid and clonazepam. Today, examination shows drooling, masked facies, and decreased blinking. He has a slow, shuffling gait with decreased arm swing. The remainder of the examination shows no abnormalities. Mental status examination shows normal speech and a mildly anxious mood. There is no evidence of psychosis. Which of the following is the most appropriate next step in management?

A) Addition of diphenhydramine to the medication regimen
B) Addition of lithium carbonate to the medication regimen
C) Cognitive behavioral therapy
D) Decreasing the dosage of risperidone
E) Increasing the dosage of clonazepam
F) Psychotherapy

Correct Answer: D.

Risperidone is an antipsychotic that is an antagonist of the dopamine receptor, which blocks dopamine signaling nonspecifically across different brain areas. Blocking dopamine signaling in the limbic system decreases psychotic symptoms, while blocking dopamine signaling in the basal ganglia leads to medication-induced parkinsonism, including bradykinesia, tremor, and cogwheel rigidity. In patients with extrapyramidal adverse effects, decreasing the dosage is necessary to reduce the adverse effects, and cessation of the offending drug may be necessary.

Incorrect Answers: A, B, C, E, and F.

Addition of diphenhydramine to the medication regimen (Choice A) can help with extrapyramidal adverse effects associated with antipsychotics, such as dystonia, akathisia, and torticollis. The most appropriate step is to decrease the dose of risperidone to help reduce parkinsonism symptoms as diphenhydramine would only offer transient benefit, if any, in the case of such subacute to late-presenting symptoms.

Addition of lithium carbonate to the medication regimen (Choice B) is an option to treat bipolar disorder. While this patient has manic episodes, this patient's symptoms are caused by adverse effects of antidopaminergic medications, and the addition of lithium would not be appropriate at this time.

Cognitive behavioral therapy (Choice C) would be appropriate in many cases of major depressive disorder, anxiety disorder, specific phobias, illness anxiety disorders, and other nonpsychotic diseases. In this case, the patient's symptoms are caused by an adverse effect of an antipsychotic medication, and cognitive behavioral therapy would not play an immediate role.

Increasing the dosage of clonazepam (Choice E) and psychotherapy (Choice F) would not help treat any extrapyramidal adverse effects of risperidone or other antipsychotics.

Educational Objective: Most antipsychotic medications antagonize dopamine receptors and therefore decrease psychotic symptoms while also leading to medication-induced parkinsonism and other extrapyramidal effects, such as dystonia, akathisia, and tardive dyskinesia. While mediations such as diphenhydramine and benzodiazepines may be useful for acute management, decreasing the dose of the antipsychotic or changing agents is most appropriate.

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23. A 67-year-old man with metastatic lung cancer comes to the physician because of malaise and lethargy during the past 3 days. Medications are ibuprofen and lisinopril. He appears cachectic but is oriented to person, place, and time. His temperature is 37°C (98.6°F), pulse is 102/min, respirations are 13/min, and blood pressure is 105/75 mm Hg. Examination shows decreased skin turgor. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hemoglobin	10.6 g/dL
Hematocrit	36%
Leukocyte count	11,100/mm^3
Platelet count	226,000/mm^3
Serum	
Na^+	136 mEq/L
K^+	3.6 mEq/L
Cl^-	96 mEq/L
HCO_3^-	28 mEq/L
Ca^{2+}	11.8 mg/dL
Urea nitrogen	22 mg/dL
Glucose	98 mg/dL
Creatinine	0.9 mg/dL
Phosphorus	2.5 mg/dL
Albumin	2.9 g/dL

Which of the following is the most appropriate initial pharmacotherapy?

A) Calcitonin
B) Hydrocortisone
C) Plicamycin
D) 0.9% Saline
E) Zoledronic acid

Correct Answer: D.

Lung cancer is often complicated by hypercalcemia caused by paraneoplastic parathyroid hormone-related peptide (PTHrP) production. This phenomenon frequently occurs in the setting of squamous cell lung cancer and may also occur in squamous cell carcinoma of the head and neck, as well as breast and kidney cancers. PTHrP acts similarly to parathyroid hormone, causing an increase in osteoclast activity via G protein-coupled receptors. It causes increased absorption of calcium in the intestine and renal tubules. Bone pain is a common manifestation. Other symptoms include abdominal discomfort, muscle pain and weakness, polyuria, and psychiatric disturbances. Hypercalcemia is associated with hypophosphatemia (caused by renal wasting of phosphate), subperiosteal bone resorption, nephrolithiasis, and end-stage kidney disease. Management is determined by the severity of calcium imbalance and symptoms. Patients with mild hypercalcemia (<12 mg/dL) with minimal or no symptoms may not require treatment. This patient, with an albumin-corrected calcium concentration of >12 mg/dL and altered mental status, requires treatment. Immediate treatment is with intravenous normal saline. This may be followed by the administration of calcitonin and a bisphosphonate, such as zoledronic acid. Patients should be monitored closely to evaluate for volume status and electrolyte disturbances.

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Glucose	98 mg/dL
Creatinine	0.9 mg/dL
Phosphorus	2.5 mg/dL
Albumin	2.9 g/dL

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A) Calcitonin
B) Hydrocortisone
C) Plicamycin
D) 0.9% Saline
E) Zoledronic acid

Correct Answer: D.

Lung cancer is often complicated by hypercalcemia caused by paraneoplastic parathyroid hormone-related peptide (PTHrP) production. This phenomenon frequently occurs in the setting of squamous cell lung cancer and may also occur in squamous cell carcinoma of the head and neck, as well as breast and kidney cancers. PTHrP acts similarly to parathyroid hormone, causing an increase in osteoclast activity via G protein-coupled receptors. It causes increased absorption of calcium in the intestine and renal tubules. Bone pain is a common manifestation. Other symptoms include abdominal discomfort, muscle pain and weakness, polyuria, and psychiatric disturbances. Hypercalcemia is associated with hypophosphatemia (caused by renal wasting of phosphate), subperiosteal bone resorption, nephrolithiasis, and end-stage kidney disease. Management is determined by the severity of calcium imbalance and symptoms. Patients with mild hypercalcemia (<12 mg/dL) with minimal or no symptoms may not require treatment. This patient, with an albumin-corrected calcium concentration of >12 mg/dL and altered mental status, requires treatment. Immediate treatment is with intravenous normal saline. This may be followed by the administration of calcitonin and a bisphosphonate, such as zoledronic acid. Patients should be monitored closely to evaluate for volume status and electrolyte disturbances.

Incorrect Answers: A, B, C, and E.

Calcitonin (Choice A) and zoledronic acid (Choice E) are useful for the acute management of hypercalcemia but should be initiated after intravenous volume resuscitation. Calcitonin inhibits osteoclast activity and reabsorption of calcium within the renal tubules. Zoledronic acid is a bisphosphonate that also inhibits osteoclast activity.

Hydrocortisone (Choice B) is a glucocorticoid that is useful for the management of Addisonian crisis in the setting of adrenal insufficiency. It does not play a role in the management of hypercalcemia associated with malignancy.

Plicamycin (Choice C) is an antibiotic that is effective in the management of hypercalcemia caused by the inhibition of osteoclasts. Plicamycin is rarely used because of its adverse effects, including thrombocytopenia, abnormal bleeding, hepatotoxicity, and renal toxicity.

Educational Objective: Lung cancer, typically squamous cell, is associated with hypercalcemia caused by parathyroid hormone-related peptide production. Symptoms of hypercalcemia include bone pain, muscle weakness, central nervous system and psychiatric disturbances, abdominal discomfort, polyuria, and renal calculi formation. Initial treatment is with intravenous fluid resuscitation.

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24. A 47-year-old man is brought to the emergency department because of severe left groin pain since he fell 2 hours ago. He is unable to walk because of the pain. He does not have pain in other joints. He has a 20-year history of ulcerative colitis. His only medication is daily prednisone. On examination, any attempts at range of motion of the left hip elicit pain. Muscle strength is intact distally and in the right lower extremity. Distal pulses are 2+. An x-ray of the pelvis and left lower hip shows moderate loss of joint space and diffuse osteopenia. Which of the following is the most appropriate next step in management?

A) Observation only
B) DEXA scan
C) MRI of the hip
D) Nonsteroidal anti-inflammatory drug therapy
E) Aspiration of the hip joint
F) Total hip arthroplasty

Correct Answer: C.

Osteoporosis and osteopenia are metabolic bone diseases characterized by diffusely low bone density. The most common risk factors are age, smoking, chronic inflammatory disease, corticosteroid use, and estrogen-depleting conditions in women. Such demineralization and low bone density is often asymptomatic but increases the risk for fractures, most commonly involving the hip, vertebrae, and distal radius. In this patient, diffuse osteopenia can limit the appearance and detection of fractures on x-rays. An occult hip fracture is likely in the setting of osteopenia or osteoporosis, and advanced imaging, such as an MRI of the hip, is the most appropriate next step in management. Calcium and vitamin D supplementation are the first line for treatment and prevention of osteoporosis. Reduction of active osteoporotic risk factors should also be pursued. Weight-bearing exercises are recommended to slow deterioration of bone mineral density. Bisphosphonates inhibit osteoclast activity. They are utilized once an individual is diagnosed with osteoporosis to reduce further loss of bone mineral density.

Incorrect Answers: A, B, D, E, and F.

Observation only (Choice A) would not be appropriate, as this patient has severe uncontrolled pain in the setting of trauma, raising suspicion for a fracture. If a hip fracture is present, he would need urgent surgical management.

DEXA scan (Choice B) is used to evaluate for osteoporosis, which is defined as a bone mineral density less than 2.5 standard deviations compared to a young, normal population (T-score). It can be useful as screening and for serial measurements in the outpatient setting. However, in a patient with suspicion of a hip fracture, a DEXA scan is not appropriate.

Nonsteroidal anti-inflammatory drug therapy (Choice D) would be appropriate in the management of hip strain or sprain. This patient's inability to walk and traumatic pain in the setting of osteoporosis is more likely the result of a hip fracture.

Aspiration of the hip joint (Choice E) would be indicated if there was suspicion for a septic arthritis of the hip. Septic arthritis typically presents with atraumatic pain of a joint, fever, and inability to range the hip. This patient's hip pain with range of motion in the setting of trauma is more likely the result of a hip fracture.

Total hip arthroplasty (Choice F) may be necessary for this patient but would be premature prior to the diagnosis of a hip fracture. Advanced imaging, such as MRI, should be pursued to evaluate for traumatic pathology in this patient.

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Total hip arthroplasty (Choice F) may be necessary for this patient but would be premature prior to the diagnosis of a hip fracture. Advanced imaging, such as MRI, should be pursued to evaluate for traumatic pathology in this patient.

Educational Objective: Osteoporosis is often asymptomatic but increases the risk for fractures, most commonly involving the hip, vertebrae, and distal radius. Osteopenia can limit the detection of occult fractures on x-rays, and when they are suspected, advanced imaging with MRI or CT scan should be pursued.

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✓ 25. A 74-year-old woman is brought to the clinic by her family because of a 7-month history of progressive confusion and urinary incontinence. During the past year, she has had multiple falls; she sustained wrist fractures 1 year ago and a left tibia fracture 3 months ago. She has hypertension, osteoporosis, and depression. She is evasive when asked how much alcohol she drinks. She appears frail. Vital signs are within normal limits. Physical examination shows a wide-based gait and marked ataxia. She is unable to attempt the Romberg test. Cranial nerve examination shows nystagmus and an inability to move her eyes horizontally. On cognitive testing, she recalls zero of three objects after 5 minutes. Laboratory studies show:

Hemoglobin	10 g/dL
Mean corpuscular volume	102 μm^3
Serum	
Vitamin B_{12} (cobalamin)	980 pg/mL (N=160–950)
Folate	3.1 ng/mL (N=2.7–17)

Which of the following is the most likely diagnosis?

A) Folic acid deficiency
B) Lewy body dementia
C) Normal-pressure hydrocephalus
D) Progressive supranuclear palsy
E) Wernicke-Korsakoff syndrome

Correct Answer: E.

Thiamine, or vitamin B_1, deficiency causes Wernicke encephalopathy and Korsakoff dementia. The classic triad of Wernicke encephalopathy presents with encephalopathy, ataxia, and oculomotor dysfunction (lateral gaze palsy and nystagmus). Wernicke encephalopathy is reversible with treatment but, if allowed to progress, may result in Korsakoff dementia. Korsakoff dementia is an irreversible condition that includes psychosis, anterograde and retrograde amnesia, and the consequent tendency to confabulate, or verbalize false stories or memories, to compensate for the inability to remember. Thiamine deficiency is common in patients with alcohol use disorder because of poor nutritional intake, thiamine malabsorption, and impaired cellular utilization of thiamine. MRI may show atrophy of the mammillary bodies. To prevent Wernicke-Korsakoff syndrome, all patients with sustained heavy alcohol use should be given thiamine supplementation, and patients presenting with acute intoxication should generally be given parenteral thiamine. While serum thiamine concentration may be decreased, this is not useful in management as it cannot be checked quickly. Thus, the diagnosis is clinical and should be rapidly treated with thiamine administration.

Incorrect Answers: A, B, C, and D.

Folic acid deficiency (Choice A) presents with megaloblastic anemia and is often seen in patients with malnutrition, alcohol use disorder, and patients taking antifolate medications (eg, phenytoin, methotrexate).

Lewy body dementia (Choice B) is characterized by fluctuating alterations in cognitive function, parkinsonism, visual hallucinations, and REM sleep behavior disorder.

Normal-pressure hydrocephalus (Choice C) is a type of communicating (nonobstructive) hydrocephalus in which the ventricles are enlarged, leading to damage of the white matter tracts connecting the

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Normal-pressure hydrocephalus (Choice C) is a type of communicating (nonobstructive) hydrocephalus in which the ventricles are enlarged, leading to damage of the white matter tracts connecting the frontal lobes and basal ganglia. It presents with the triad of cognitive impairment, urinary incontinence, and gait instability.

Progressive supranuclear palsy (Choice D) is a parkinsonian syndrome that typically presents with gait instability, oculomotor deficits (classically, vertical gaze palsy), frontal lobe deficits, bradykinesia, and muscle rigidity. Nystagmus and lateral gaze palsy would be atypical.

Educational Objective: Chronic alcohol use disorder and associated malnutrition may result in thiamine deficiency, which can cause Wernicke-Korsakoff syndrome. The syndrome is characterized by altered mental status, ophthalmoplegia, ataxia, psychosis, and anterograde and retrograde amnesia. Thiamine supplementation can prevent the development of Wernicke-Korsakoff syndrome in patients with alcohol use disorder.

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26. Eight days after he was involved in a motor vehicle collision in which he was the restrained driver, a hospitalized 28-year-old man has hypertension. He underwent extensive reconstructive orthopaedic operations for injuries to his left clavicle, shoulder, and femur and exploratory laparotomy for a ruptured spleen. Urine toxicology screening on admission was positive for Δ⁹-tetrahydrocannabinol, cocaine, and opiates. He was intubated and mechanically ventilated during the procedures and was extubated on hospital day 4. He receives oral acetaminophen-oxycodone as needed. His blood pressure has been 180/110 mm Hg; it decreases to 150/80 mm Hg when he receives his pain medication. An abdominal bandage covers the surgical incision. The nurse tells the physician that the patient rates his pain as a 10 on a 10-point scale and is constantly asking for pain medications. Which of the following is the most appropriate next step in pharmacotherapy for this patient's hypertension?

A) Continued administration of acetaminophen-oxycodone every 4 hours
B) Continuous intravenous labetalol infusion with titration
C) Intravenous nitroprusside therapy
D) Patient-controlled morphine
E) Switching from acetaminophen-oxycodone to tramadol

Correct Answer: D.

Postoperative pain control is a vital component of caring for the surgical patient. Inadequately treated pain can lead to hypertension and patient dissatisfaction as well as delayed recovery caused by decreased ambulation and increased hospital length of stay. This can be exceptionally challenging in patients taking opioids prior to surgery as they often have an increased tolerance to opioids and require larger doses than the opioid-naive patient. The classic approach to perioperative pain control includes a multimodal technique, including acetaminophen, local anesthetics, nonsteroidal anti-inflammatory drugs, and oral and intravenous opioids. Patient-controlled analgesia is a method of providing pain control frequently used in the opioid-tolerant population or for those with significant postoperative pain. It involves programming a pump to deliver a small bolus dose of parenteral opioid in response to the patient pressing a button with a lockout interval and maximum dose to prevent overdose. This allows the patient to control the frequency of analgesic medication rather than be reliant on the nurse for pain medication distribution and improves patient satisfaction. Additionally, it allows the practitioner to calculate a total opioid requirement that may be utilized to transition the patient to an effective oral regimen. This patient has hypertension likely related to his ongoing significant pain in the setting of previous opioid use, given that his blood pressure improves after pain medication administration. Therefore, the most appropriate pharmacotherapy to improve his hypertension should be aimed at treating his pain.

Incorrect Answers: A, B, C, and E.

Continued administration of acetaminophen-oxycodone every 4 hours (Choice A) may improve this patient's pain temporarily but does not seem to provide lasting benefit, as he continues to report pain. While it briefly decreases his blood pressure, it likely does not provide lasting pain control or is an inadequate dose to control pain. Transitioning to patient-controlled morphine is likely to adequately control pain and therefore improve blood pressure.

Continuous intravenous labetalol infusion with titration (Choice B) and intravenous nitroprusside therapy (Choice C) are used to treat severe hypertension. This patient's hypertension is likely secondary to inadequately treated pain. Therefore, improving pain control is more likely to improve blood pressure with minimum risk for adverse effects.

Switching from acetaminophen-oxycodone to tramadol (Choice E) would likely worsen blood pressure, as tramadol is a weaker opioid than oxycodone. Thus, tramadol would provide even less adequate pain control. Poor pain control is likely to lead to worsening blood pressure.

Educational Objective: Inadequately treated pain in the postoperative patient can lead to hypertension, delayed recovery, and patient dissatisfaction. Patient-controlled analgesia is an option for treating moderate to severe pain, especially in previously opioid-tolerant patients or in patients unable to take oral pain medications. It provides small boluses of parenteral opioids with lockout intervals and maximum doses to prevent overdose. It can also allow the practitioner to calculate a total opioid requirement that can be utilized for transitioning the patient to an adequate oral regimen.

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27. A 37-year-old primigravid woman at 16 weeks' gestation comes to the physician to discuss the results of amniocentesis. She has an IQ of 70. She is employed as a housekeeping assistant in a hotel and has been married to a coworker for 6 months. She has no family history of serious illness. Karyotype analysis of the fetus showed trisomy 21. Her pregnancy has been otherwise uncomplicated. She is informed of the abnormalities associated with the fetal genotype and still wants to continue the pregnancy. Which of the following is the most appropriate next step in management?

A) Schedule the patient for ongoing prenatal care
B) Discuss the situation with the patient's husband
C) Try to convince the patient to change her decision
D) Seek a court-appointed guardian
E) Refer the patient for psychiatric evaluation to determine competence

Correct Answer: A.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. Capacity assessments should be based on the individual patient and the particular medical decision being made. Certain populations are at increased risk for limitations of capacity, such as patients with dementia or psychiatric disorders. IQ scoring was previously used as a definitional criterion for intellectual disability but has been replaced in the DSM-5 by a scale based on degrees of impairment in a variety of adaptive skills (practical, social, conceptual). This patient has a low IQ score but functions independently and does not meet criteria for intellectual disability. Even among patients with intellectual disability, capacity cannot be assumed to be globally lacking but must be assessed on a case-by-case basis. This patient should be scheduled for ongoing prenatal care in accordance with her expressed preference to continue her pregnancy.

Incorrect Answers: B, C, D, and E.

Discussing the situation with the patient's husband (Choice B) and seeking a court-appointed guardian (Choice D) are both incorrect. This patient has expressed a preference to continue her pregnancy and has not demonstrated a lack of decisional capacity.

Trying to convince the patient to change her decision (Choice C) is inappropriate, may impair the patient-physician relationship, and may be viewed as condescending.

Referring the patient for psychiatric evaluation to determine competence (Choice E) is incorrect. Capacity assessments are decision-specific and based on a discussion with the patient in order to assess understanding, appreciation, reasoning, and choice, and can be conducted by any physician. In contrast, competency is a global assessment that determines the ability of an individual to participate in legal proceedings. Competency assessments must be made by a judge, rather than a psychiatrist.

Educational Objective: Capacity assessments should be based on the individual patient and the particular medical decision being made. They are based on a discussion with the patient in order to assess understanding, appreciation, reasoning, and choice. IQ scoring is no longer used as a criterion for intellectual disability. Among patients with intellectual disability, capacity assessment must be made on a case-by-case basis and cannot be assumed to be lacking.

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28. A 29-year-old male US Navy veteran comes to the local Veterans Affairs clinic because of a 2-week history of purulent drainage from a small opening at the site of amputation of his left arm. For the past 10 days, he has had increasing pain, tenderness, and redness at the wound site. Thirteen months ago, the patient sustained a traumatic amputation of the left arm below the elbow when an improvised explosive device detonated while he was on a combat mission in the Middle East. Management at that time consisted of aggressive surgical debridement of the residual limb, which has healed slowly; a small part of the wound appeared to heal incompletely. The patient appears well. Vital signs are within normal limits. Examination of the left upper extremity shows a 3-mm opening in the scar with surrounding erythema; the site is draining purulent material. The remainder of the examination shows no abnormalities. Which of the following studies is most likely to confirm the diagnosis?

A) Bone biopsy of the wound site
B) Complete blood count with differential
C) Erythrocyte sedimentation rate and serum C-reactive protein concentration
D) X-ray of the left upper extremity residual limb

Correct Answer: A.

This patient likely has chronic osteomyelitis with adjacent soft tissue infection and a draining sinus tract to the skin. The bone was likely seeded at the time of his limb injury and treatment, especially given the evidence that part of the wound experienced poor healing. Chronic osteomyelitis can present as an indolent infection with gradually increasing pain at the affected site, low-grade fever, chills, and unexplained weight loss. X-rays may show lytic lesions and cortical destruction, and laboratory studies generally show increased serum inflammatory markers (eg, C-reactive protein). A bone biopsy of the wound site is needed to confirm the diagnosis, with the additional benefit of identifying the causal organism and testing for antibiotic susceptibilities.

Incorrect Answers: B, C, and D.

Complete blood count with differential (Choice B) should be checked and may provide evidence of infection with leukocytosis and left shift on the differential. However, it will not confirm the presence of osteomyelitis.

Erythrocyte sedimentation rate and serum C-reactive protein concentration (Choice C) should also be checked, as these inflammatory markers are expected to be increased in the setting of infection. They are useful in monitoring the progression of treatment and in making management decisions, as they should decrease with successful therapy.

X-ray of the left upper extremity residual limb (Choice D) is not recommended in the evaluation of acute osteomyelitis but may show findings in chronic cases that suggest bone involvement, such as soft tissue edema, bone loss, and periosteal reaction. However, plain radiography is not specific enough to confirm the diagnosis.

Educational Objective: Osteomyelitis is an infection of bone and the marrow cavity, and can present acutely or as a chronic, indolent infection. Laboratory studies will show an increase in inflammatory markers such as erythrocyte sedimentation rate and serum C-reactive protein concentration, and x-rays may show lytic lesions and cortical destruction. Bone biopsy and culture is recommended to confirm diagnosis and tailor antibiotics to the causative organism.

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29. A 2-year-old girl is brought to the physician because of a 2-week history of difficulty walking and intermittent crossing of the eyes. She also has had three to four episodes of watery diarrhea daily during this time. She has not had fever or vomiting. She has no history of serious illness and receives no medications. She is alert but irritable and tearful; she clings to her mother during the examination. She is at the 50th percentile for length, 25th percentile for weight, and 50th percentile for head circumference. Her pulse is 100/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. The abdomen is soft and nontender; a smooth, firm mass is palpated over the right upper quadrant. Neurologic examination shows rapid, chaotic, multidirectional saccades of the eyes. There are jerking motions of the extremities, which are exacerbated by intentional movement. There is truncal ataxia, and the patient is unable to sit or walk without assistance. Which of the following is the most likely underlying cause of this patient's symptoms?

A) Hepatoblastoma
B) Medulloblastoma
C) Nephroblastoma (Wilms tumor)
D) Neuroblastoma
E) Non-Hodgkin lymphoma
F) Rhabdomyosarcoma

Correct Answer: D.

Opsoclonus myoclonus syndrome (OMS) typically presents in children between age 1 to 3 years with the acute onset of truncal ataxia, myoclonus, and opsoclonus, a form of saccadic intrusion. Ocular saccades are rapid, conjugate, ballistic ocular movements that occur in order to rapidly and precisely change the point of gaze fixation. Saccades are normal ocular movements that may be voluntarily initiated, although saccadic abnormalities occur in various pathologic conditions. Opsoclonus is characterized by rapid, arrhythmic, multivectorial ocular saccades that occur without an intersaccadic interval. These features distinguish this entity from nystagmus and other saccadic disorders. Patients also typically display irritability, developmental regression, and behavioral or sleep disturbances. The underlying cause of OMS is unclear, but it often occurs as a paraneoplastic phenomenon in association with neuroblastoma. Neuroblastoma is a neoplasm of neuroendocrine cells of the sympathetic nervous system and is associated with overamplification of the *MYCN* oncogene. It may arise from any sympathetic nervous tissue and is the most common tumor of the adrenal gland that occurs in children. Adrenal involvement classically presents with abdominal pain and distension, weight loss, and failure to thrive. Physical examination may disclose a firm, nodular mass that crosses the midline and diastolic hypertension. Diagnosis is suggested by the presence of increased catecholamine metabolites in the serum and urine. Treatment and prognosis are dependent on the stage of the tumor at diagnosis and the presence or absence of *MYCN* amplification.

Incorrect Answers: A, B, C, E, and F.

Hepatoblastoma (Choice A) is a neoplasm of hepatocyte precursor cells that occurs in children, frequently in association with Beckwith-Wiedemann syndrome. It is not commonly associated with OMS.

Medulloblastoma (Choice B) is the most common malignant brain tumor in children, often presenting in patients age 5 to 9 years with signs of increased intracranial pressure (eg, headache, nausea, vomiting) and gait ataxia or incoordination. It is not a common cause of OMS.

Nephroblastoma (Wilms tumor) (Choice C) is the most common pediatric renal malignancy and is characterized by a large, often palpable, unilateral flank mass. It is associated with Beckwith-Wiedemann syndrome but is not commonly associated with OMS.

Non-Hodgkin lymphoma (Choice E) encompasses a heterogeneous group of neoplasms and is among the most common malignancies in children. Patients typically present with constitutional symptoms,

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Rhabdomyosarcoma (Choice F) is a rare, aggressive neoplasm of mesenchymal skeletal muscle precursors that may occur in the orbit or genitourinary tract. Orbital rhabdomyosarcoma typically presents in children age 5 to 7 years with proptosis and globe displacement. Rhabdomyosarcoma does not typically produce paraneoplastic phenomena such as OMS.

Educational Objective: Opsoclonus myoclonus syndrome (OMS) typically presents in children between age 1 to 3 years with the acute onset of truncal ataxia, myoclonus, and opsoclonus. Opsoclonus is characterized by rapid, arrhythmic, multivectorial ocular saccades that occur without an intersaccadic interval. OMS often occurs as a paraneoplastic phenomenon that, in children, frequently indicates an underlying neuroblastoma.

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30. Three days after admission to the hospital for acute bacterial endocarditis, a 62-year-old man has shortness of breath that began 5 minutes ago while walking for the first time since admission. On admission, he had a 10-day history of fever; examination showed splinter hemorrhages and normal heart sounds without murmurs. His current pulse is 110/min, respirations are 24/min, and blood pressure is 100/50 mm Hg. Crackles are heard over both lung bases. S_1 and S_2 are soft; there is an S_3. A new grade 2/6, early diastolic murmur is heard at the apex and the left sternal border, and a grade 4/6, systolic ejection murmur is heard best in the carotids and at the left sternal border. Which of the following is the most appropriate next step in management?

A) Echocardiography
B) Ventilation-perfusion lung scans
C) Intravenous furosemide therapy
D) Intravenous heparin therapy
E) Sublingual nitroglycerin therapy

Correct Answer: A.

The development of a new murmur in the setting of acute infective endocarditis is highly concerning for valve damage, and this patient should be evaluated with echocardiography promptly. Complications from infective endocarditis occur by two main mechanisms: septic embolization with seeding of distal sites and direct injury to cardiac tissue. Cardiac complications include heart failure caused by valvular insufficiency, perivalvular abscess, pericarditis, tamponade, and intracardiac fistula formation. Valvular insufficiency as a result of direct inflammatory damage is the most common cardiac complication associated with infective endocarditis and may require surgical intervention if severe.

Incorrect Answers: B, C, D, and E.

Ventilation-perfusion lung scans (Choice B) are useful in evaluating for pulmonary embolism in patients who cannot tolerate CT angiography (usually because of renal disease preventing the use of contrast, pregnancy, or a contrast allergy). Septic embolization to the lungs often occurs in infective endocarditis affecting the tricuspid or pulmonary valves.

Intravenous furosemide therapy (Choice C) is indicated for volume overload states and is commonly utilized in treatment of heart failure exacerbations and valvulopathy. However, in the setting of endocarditis, a new murmur should first be evaluated with echocardiography.

Intravenous heparin therapy (Choice D) is indicated for treatment of acute thromboembolic disease, which is a complication of infective endocarditis. This patient's physical examination findings are more suggestive of cardiac valve dysfunction.

Sublingual nitroglycerin therapy (Choice E) is not indicated, as this patient's clinical setting and examination findings are not suggestive of cardiac ischemia.

Educational Objective: Valve damage is a common complication of infective endocarditis, and the clinician should maintain a low threshold for evaluating new murmurs and cardiac symptoms with echocardiography in management of these cases. Valvular insufficiency as a result of direct inflammatory damage is the most common cardiac complication associated with infective endocarditis and may require surgical intervention if severe.

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✓ 31. A study is proposed to investigate the effectiveness of a third-generation cephalosporin for the treatment of streptococcal pharyngitis. The study will include children between the ages of 5 and 10 years. They will be randomly assigned to receive treatment with a cephalosporin, penicillin, or a placebo. Informed consent will be obtained from one parent. The principal investigator offers a $50 finder's fee to any medical resident who identifies a possible study participant. Which of the following features of this study is of greatest potential concern?

A) Consent only obtained from one parent
B) Use of finder's fees to recruit subjects
C) Use of minors as subjects
D) Use of placebo as treatment

Correct Answer: D.

The use of a placebo allows for the concealment of the administration of the experimental drug from the subject or from the clinician and helps demonstrate the efficacy of the experimental drug by accounting for the beneficial effects that the subject may experience secondary to the administration of any intervention by the clinician. While the use of a placebo can lend validity to a well-designed clinical trial, it poses ethical dilemmas when effective treatments exist for the disease under study (eg, penicillins for streptococcal pharyngitis). Many researchers advocate that trials be designed to compare the experimental drug against the current standard of care, rather than a placebo. The ethical dilemma is unambiguous in situations such as the one presented in this case, where an effective, standard treatment regimen exists, and where the administration of a placebo could cause harm. In such scenarios, the use of a placebo would be unethical and should be strictly avoided.

Incorrect Answers: A, B, and C.

Consent only obtained from one parent (Choice A) is incorrect. Under United States federal guidelines, consent from both parents is generally required but may be waived under particular circumstances, such as when one parent has sole legal responsibility for the child, or when one parent is deceased, unknown, incompetent, or not reasonably available.

Use of finder's fees to recruit subjects (Choice B) is incorrect. Finder's fees are often viewed as unethical because of their propensity to create conflict of interest and are illegal under antikickback statutes in particular jurisdictions. However, the use of a placebo in this study represents a greater concern because of the potential for harm to study participants who are randomized to the placebo.

Use of minors as subjects (Choice C) is incorrect. While children are considered a vulnerable population because of their inability to give informed consent, some conditions or treatments may be best studied in pediatric populations where the disease under study is more prevalent, such as in the example of streptococcal pharyngitis.

Educational Objective: The use of a placebo may be inappropriate in situations where an effective treatment is known to exist. A placebo should not be used in situations where its use could cause harm. In such circumstances, the experimental drug should be compared with the standard treatment, rather than a placebo.

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32. A 27-year-old woman comes to the physician for a follow-up examination. She has a 5-month history of temperatures to 38.3°C (101°F) and a cough productive of phlegm and mucous plugs. She has severe asthma treated with high doses of prednisone. She has had numerous visits to the emergency department since childhood because of uncontrolled symptoms. Expiratory wheezes are heard bilaterally. Laboratory studies show:

Hemoglobin	14.6 g/dL
Leukocyte count	8700/mm^3
Segmented neutrophils	60%
Eosinophils	18%
Lymphocytes	22%
Serum IgE	23,000 IU/mL

An x-ray of the chest shows patchy bilateral upper lobe infiltrates that have shifted in location since an x-ray was taken 4 months ago. A CT scan of the chest shows central bronchiectasis without lymphadenopathy. This patient is most likely to have an immediate response to which of the following on skin testing?

A) Animal dander
B) *Aspergillus fumigatus*
C) *Bacillus subtilis*
D) *Cladosporium* species
E) Isocyanate
F) Thermophilic actinomycetes

Correct Answer: B.

Allergic bronchopulmonary aspergillosis is a hypersensitivity reaction caused by the presence of *Aspergillus fumigatus* organisms in the airways. The clinical syndrome is associated with transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis. Patients typically present with constitutional symptoms, including generalized fatigue and mild fever, progressive cough, and asthma-like symptoms that persist despite treatment. Brown or black sputum and hemoptysis may be noted. Laboratory studies are notable for eosinophilia and increased serum IgE concentrations. Skin testing for a response to *Aspergillus* antigens and *Aspergillus*-specific antibody serum assays can aid in diagnosis. CT scan of the chest is the gold standard for diagnosis and is characterized by central bronchiectasis and signs of mucoid impaction. Treatment consists of systemic corticosteroids, antifungal agents, and anti-IgE immunologics depending on the severity and chronicity of the syndrome.

Incorrect Answers: A, C, D, E, and F.

Animal dander (Choice A) is a common cause of asthma and allergic rhinitis. It would be unusual to be so refractory to treatment in a patient who is able to avoid exposure. It is not associated with transitory pulmonary infiltrates or bronchiectasis.

Bacillus subtilis (Choice C), colloquially known as grass or hay bacillus, is the most studied gram-positive bacteria and is used for production of bacitracin. Bacitracin is a common allergen (and topical antibiotic) that causes contact dermatitis.

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Bacillus subtilis (Choice C), colloquially known as grass or hay bacillus, is the most studied gram-positive bacteria and is used for production of bacitracin. Bacitracin is a common allergen (and topical antibiotic) that causes contact dermatitis.

Cladosporium species (Choice D) are the most common black mold organisms that grow in moist indoor environments, and inhalation of spores can cause hypersensitivity symptoms, including asthma, allergic rhinitis, and hypersensitivity pneumonitis. This patient's presentation is more consistent with allergic bronchopulmonary aspergillosis.

Isocyanates (Choice E) are organic compounds widely used in manufacturing and are implicated in causing occupational asthma. Symptoms are worse when the patient is at the workplace and improve when they are at home.

Thermophilic actinomycetes (Choice F) are ubiquitous soil and plant matter organisms associated with hypersensitivity pneumonitis in farmers and cattle workers (Farmer's lung). Patients develop chronic bronchitis and asthma symptoms.

Educational Objective: Allergic bronchopulmonary aspergillosis is a hypersensitivity reaction caused by *Aspergillus fumigatus*, and patients with asthma or cystic fibrosis are at increased risk. Patients present with chronic cough that may be productive of dark-colored sputum and hemoptysis. Characteristic findings include transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis.

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33. A 4-year-old boy undergoes splenectomy to control bleeding from injuries sustained in a motor vehicle collision. His postoperative course is uncomplicated, and he receives pneumococcal and meningococcal vaccinations in preparation for his discharge home. After discharge, which of the following is the most appropriate follow-up intervention to decrease this patient's risk for subsequent infection?

A) Avoidance of influenza vaccinations
B) Ciprofloxacin prophylaxis
C) Folic acid supplementation
D) Penicillin prophylaxis
E) No further intervention is indicated

Correct Answer: D.

Asplenia can occur because of congenital anomalies, splenectomy after trauma, or because of chronic vasoocclusion and infarction in conditions such as sickle cell disease. The spleen removes opsonized pathogens and infected cells by mechanical filtration in the sinusoids and by phagocytosis by splenic macrophages. Additionally, the spleen houses immunoglobulin-producing B lymphocytes. The spleen plays an important role in the clearance of encapsulated pathogens such as *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*, among others. Thus, patients lacking a spleen are at risk for infection with encapsulated bacteria, and antibiotic prophylaxis against these organisms is often indicated, typically with penicillin or amoxicillin.

Incorrect Answers: A, B, C, and E.

Avoidance of influenza vaccinations (Choice A) would not be indicated, as patients with functional asplenia are immunocompromised and at increased risk for infections.

Ciprofloxacin prophylaxis (Choice B) is not typically used for antibiotic prophylaxis in asplenia. While fluoroquinolones can be used in patients with a penicillin allergy, they are not the most appropriate initial follow-up intervention.

Folic acid supplementation (Choice C) is recommended in pregnancy to decrease the risk for neural tube defects. It is also commonly warranted in patients with rapid cellular turnover, such as acute leukemia and sickle cell disease, to offset the consumption of folic acid in cell division. It is not indicated in the treatment of asplenia.

No further intervention (Choice E) would be harmful as patients with asplenia are at increased risk for infection for encapsulated bacteria, and patients should be treated with vaccination and antibiotic prophylaxis against encapsulated organisms.

Educational Objective: Splenectomy increases the risk for infection with encapsulated organisms such as *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*. Patients with impaired splenic function often require antibiotic prophylaxis, typically with penicillin or amoxicillin.

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34. A 22-year-old nulligravid woman with cystic fibrosis comes to the physician because she would like to conceive within the next year. She has not been hospitalized in the past 3 years. Her disease is well controlled with antibiotics, vigorous bronchial drainage, bronchodilators, and nutritional support including pancreatic enzyme replacement. She is 155 cm (5 ft 1 in) tall and weighs 38 kg (83 lb); BMI is 16 kg/m^2. Her pulse is 96/min, and blood pressure is 138/86 mm Hg. Examination shows no other abnormalities except for a prolonged expiratory phase. Her husband is healthy and has no family history of cystic fibrosis. She should be told that she will most likely require which of the following during pregnancy?

A) Additional antibiotic therapy
B) Insulin therapy
C) Nutritional supplementation
D) Oxygen therapy
E) Multiple hospital admissions

Correct Answer: C.

Cystic fibrosis is a genetic disorder caused by abnormalities in chloride ion transport that causes thickened secretions in a variety of organ systems, most notably the respiratory tract and the gastrointestinal system. This leads to the common presenting symptoms of recurrent pneumonia, sinusitis, pancreatic insufficiency, and pancreatitis. Most cystic fibrosis cases are diagnosed on neonatal screening performed shortly after birth. Malnutrition is common in patients with cystic fibrosis, as their pancreatic insufficiency causes inadequate absorption of protein, fat, and vitamins. This patient has signs of long-term malnutrition, such as small stature and low BMI. This malnutrition is likely to be worsened in pregnancy as her nutritional requirements increase to provide the developing fetus with appropriate nutrients. Thus, she is most likely to require nutritional supplementation during her pregnancy to prevent complications such as fetal growth restriction.

Incorrect Answers: A, B, D, and E.

Additional antibiotic therapy (Choice A) would be dependent on the patient's pulmonary status, rather than on pregnancy itself. It is possible that she develops an infection during pregnancy, but she will not necessarily be at increased risk for its development. Additionally, her cystic fibrosis is well controlled now, with no recent hospitalizations or infections, making the likelihood of needing future antibiotics lower.

Insulin therapy (Choice B) is used to treat diabetes mellitus, which can occur during pregnancy. Diabetes mellitus is also common in cystic fibrosis as a result of pancreatic endocrine dysfunction. However, it more frequently presents at a younger age. As this patient does not currently have cystic fibrosis-related diabetes mellitus, she is not more likely to require insulin therapy than a parturient patient without cystic fibrosis.

Oxygen therapy (Choice D) is unlikely to be necessary in this patient. She has good baseline lung function given her underlying disease and has had no recent infections or hospitalizations. Thus, pregnancy itself will not increase her risk for needing supplemental oxygen therapy.

Multiple hospital admissions (Choice E) are not more likely for this patient. Many patients are hospitalized during their pregnancy for a variety of obstetric reasons. This patient's well-controlled cystic fibrosis is unlikely to lead to additional hospitalizations.

Educational Objective: Cystic fibrosis is a genetic disorder caused by abnormalities in chloride ion transport that causes thickened secretions in a variety of organ systems, notably the respiratory tract and the gastrointestinal system. Malnutrition is common in patients with cystic fibrosis, as pancreatic insufficiency causes inadequate absorption of protein, fat, and vitamins. This can be worsened in hypermetabolic states, such as those associated with pregnancy.

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35. A 6-month-old girl is brought to the emergency department by her parents because of a 2-day history of temperatures to 39.4°C (103.0°F), irritability, decreased oral intake, and vomiting. She has no history of serious illness and receives no medications. She has not received any vaccinations. She appears acutely ill and is lethargic. Temperature is 38.9°C (102.0°F), pulse is 170/min, respirations are 60/min, and blood pressure is 70/45 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 95%. Examination discloses a bulging fontanel and decreased responsiveness. Lumbar puncture is performed. Results of cerebrospinal fluid analysis are shown:

RBC	2/mm^3
WBC	800/mm^3
Neutrophils	88%
Monocytes	12%
Glucose	15 mg/dL
Protein	150 mg/dL

Broad-spectrum antibiotic and corticosteroid therapy is initiated. Which of the following is the most likely long-term complication of this patient's condition?

A) Epidural abscess
B) Hearing loss
C) Obstructive hydrocephalus
D) Seizure disorder
E) Subdural effusion

Correct Answer: B.

Bacterial meningitis in infants commonly presents with fever or hypothermia, lethargy, irritability, a bulging fontanelle, poor feeding, and seizures. Leukocytosis is common on laboratory examination, and evaluation of the cerebrospinal fluid will show an increased white blood cell count with predominant neutrophils, increased protein, and decreased glucose. Thorough evaluation also includes a complete blood count, blood culture, and urine culture to evaluate for other causes of sepsis, as well as culture of the cerebrospinal fluid to determine the causative organism. Common causes of neonatal meningitis include *Escherichia coli*, *Streptococcus agalactiae*, and *Listeria monocytogenes*. Based on age though, alternative bacterial pathogens should be considered. *Haemophilus influenzae* commonly causes meningitis in children aged 6 months to 6 years, especially unvaccinated children. Meningitis is commonly treated with broad-spectrum antibiotics, and complications include lifelong neurologic deficits, such as developmental delay and hearing loss. Hearing loss is one of the most common long-term complications of bacterial meningitis and may be transient or permanent.

Incorrect Answers: A, C, D, and E.

Epidural abscess (Choice A) can be an acute complication of meningitis but would not be a long-term complication after the treatment of meningitis.

Obstructive hydrocephalus (Choice C) can be a complication of Chiari malformations that presents as a large head circumference and bulging anterior fontanelle as a result of downward displacement of the cerebellar vermis and tonsils. It can also result from subarachnoid hemorrhage blood products circulating within the subarachnoid space and also meningitis caused by inflammation and scarring of the dura, however, is less common than hearing loss in this setting.

Seizure disorder (Choice D) can occur during active or resolved meningitis but is a less common long-term complication than hearing loss.

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Seizure disorder (Choice D) can occur during active or resolved meningitis but is a less common long-term complication than hearing loss.

Subdural effusion (Choice E) can occur in some children with bacterial meningitis, but they produce few symptoms and often do not require treatment.

Educational Objective: Bacterial meningitis in infants commonly presents with fever or hypothermia, lethargy, irritability, a bulging fontanelle, poor feeding, and seizures. Hearing loss is a common transient or permanent long-term complication of pediatric bacterial meningitis.

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36. A 16-year-old girl is brought to the physician by her mother because she has never had a menstrual period. She is 147 cm (4 ft 10 in) tall and weighs 52 kg (115 lb); BMI is 24 kg/m^2. Her temperature is 37.1°C (98.8°F), pulse is 70/min, respirations are 14/min, and blood pressure is 110/60 mm Hg. Breast and pubic hair development is sexual maturity rating stage 1, and there is scant axillary hair. Pelvic examination shows no abnormalities. Her serum follicle-stimulating hormone concentration is 62 mIU/mL. Which of the following is the most appropriate next step in management?

A) Observation only
B) Karyotype analysis
C) Hysterosalpingography
D) MRI of the sella turcica
E) Gonadotropin-releasing hormone stimulation test

Correct Answer: B.

Gonadal dysgenesis 45,X (Turner syndrome) is a common cause of primary amenorrhea, which is secondary to gonadal (ovarian) dysgenesis in the setting of a 45,XO genotype. Other signs of Turner syndrome include a short stature, cystic hygroma or webbed neck, swelling in the hands and/or feet, coarctation of the aorta, bicuspid aortic valve, fused kidney, and infertility. Additionally, decreased estrogen concentrations may cause failure to develop mature secondary sexual characteristics of breast and pubic hair development. Patients may also develop vaginal atrophy or dryness related to low estrogen concentrations, similar to postmenopausal patients. Vital signs will be within normal limits. Diagnosis is made with a karyotype analysis, which would be the most appropriate next step in the management of this patient's condition. Other laboratory values that may aid in diagnosis are increased concentrations of luteinizing hormone and follicle-stimulating hormone caused by the lack of negative feedback from estrogen, but these findings are nonspecific.

Incorrect Answers: A, C, D, and E.

Observation only (Choice A) is inappropriate. This patient has primary amenorrhea with physical characteristics classic of Turner syndrome and should undergo karyotype analysis to confirm the diagnosis.

Hysterosalpingography (Choice C) can be used in the evaluation of congenital uterine anomalies or infertility. While some structural abnormalities of the uterus are associated with amenorrhea, these are often evident on pelvic examination. Additionally, congenital uterine anomalies would not affect stature or cause lack of secondary sexual characteristics.

MRI of the sella turcica (Choice D) can be used to evaluate the pituitary gland. Lesions in the pituitary gland can cause hypopituitarism, which presents with fatigue, ovarian dysfunction, and short stature. While this patient demonstrates some of these features, hypopituitarism would be associated with a decreased, rather than an increased, follicle-stimulating hormone concentration.

Gonadotropin-releasing hormone stimulation test (Choice E) is used to evaluate central precocious puberty. Precocious puberty refers to the onset of secondary sexual characteristics before the age of 8 years in females or 9 years in males. This patient has delayed, rather than precocious, pubertal development.

Educational Objective: Gonadal dysgenesis 45,X (Turner syndrome) is the most common cause of primary amenorrhea, which is a result of ovarian dysgenesis. Other signs include the absence of secondary sexual characteristics, short stature, cystic hygroma or webbed neck, swelling in the hands and/or feet, coarctation of the aorta, bicuspid aortic valve, fused kidney, and infertility. Luteinizing hormone and follicle-stimulating hormone concentrations are typically increased as a result of the absence of negative feedback from estrogen. Diagnosis is made with a karyotype analysis.

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37. A 7-year-old boy is brought to the physician because of a 4-day history of a dry, mildly itchy rash. The rash began as a small, pink, oval area on his chest and progressed to scaly, red patches over his arms, legs, and body. His mother applied calamine lotion and a topical corticosteroid cream without relief. He is currently taking amoxicillin for streptococcal pharyngitis diagnosed 4 days ago. He has no other history of rash or serious illness. He is alert and cooperative and in no acute distress. The pharynx is pink, and the tonsils are slightly enlarged with no exudate. The neck is supple with no adenopathy. A photograph of the rash over the trunk is shown. Which of the following is the most likely diagnosis?

A) Drug allergy
B) Pityriasis rosea
C) Scarlet fever
D) Seborrheic dermatitis
E) Tinea corporis

Correct Answer: B.

Pityriasis rosea is a cutaneous eruption characterized by the acute onset of a pruritic patch, or “herald patch,” that is followed by the development of numerous smaller macules and patches. It commonly involves the trunk and proximal extremities. The individual patches of pityriasis rosea are oval in shape, and their longitudinal axis is often lined up with the relaxed skin tension lines bilaterally on the trunk. They are typically scaly and have a rim around the leading edge of any new lesion. In patients with darker skin types, pityriasis rosea may take on a papular appearance or may demonstrate hyperpigmentation. It is usually induced by a viral infection including human herpesvirus 6 and 7, though often the exact infection is not determined. Pityriasis rosea self-resolves within 6 to 8 weeks without treatment, though topical corticosteroids may be used for symptomatic management of pruritus.

Incorrect Answers: A, C, D and E.

Drug allergy (Choice A) may occur in the setting of antibiotic use, particularly those in the penicillin and sulfonamide classes. It may present with urticaria or erythema multiforme, which is characterized by targetoid lesions on the palms, soles, trunk, extremities, and oral mucosa, as well as fever, myalgias, and arthralgias.

Scarlet fever (Choice C) can present with an erythematous and swollen tongue, rash, and desquamation of hands and feet. The rash of scarlet fever is characteristically a rough, papular, diffuse body rash.

Seborrheic dermatitis (Choice D) presents with chronic erythema, flaking, and pruritus of the skin, typically on the scalp or intertriginous folds. *Malassezia* yeast is thought to play a role in its pathogenesis.

Tinea corporis (Choice E) is caused by a superficial dermatophyte infection of the skin, most often *Trichophyton rubrum.* The classic appearance is a round, annular patch or plaque with a scaly border. Treatment is with a topical antifungal, such as eletrimazole, or systemic antifungal, if widespread.

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Educational Objective: Pityriasis rosea is characterized by the acute onset of a pruritic patch followed by the development of numerous smaller macules and patches in the setting of a recent viral illness. The individual patches of pityriasis rosea are oval in shape, scaly, and have a rim of scale around the leading edge. This patient should be reassured that the condition will self-resolve in 6 to 8 weeks and can be treated symptomatically with topical corticosteroids in the meantime.

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38. A 3-month-old girl is brought to the physician because of constipation. She was born at home at term following an uncomplicated pregnancy and weighed 3118 g (6 lb 14 oz). She has not had routine well-child examinations. She is unable to hold her head up, does not roll over, and does not smile. She is at the 10th percentile for length, 5th percentile for weight, and 75th percentile for head circumference. The posterior fontanel is 2 cm in diameter. The tongue is large and protuberant. Which of the following is most likely to confirm the diagnosis?

A) Diet history
B) Thyroid function tests
C) Upper gastrointestinal series
D) Cranial ultrasonography
E) Rectal biopsy

Correct Answer: B.

Congenital hypothyroidism commonly presents in the first few months of life with feeding difficulties, lethargy, constipation, myxedematous facies, macroglossia, large fontanelles, hypotonia, and hypothermia. Infants with this disorder may also present with goiter or congenital cardiac, renal, or gastrointestinal malformations. Thyroid dysfunction can be caused by a variety of mechanisms, including thyroid dysgenesis, resistance to TSH, abnormalities in thyroid hormone transport, iodine deficiency, maternal antibodies, or antithyroid medications. Congenital hypothyroidism is typically identified on routine newborn screening. Thyroid function tests will confirm the diagnosis. It is treated with thyroid hormone supplementation (eg, levothyroxine) and can lead to intellectual disability or neurologic issues (eg, hearing loss, ataxia) if untreated.

Incorrect Answers: A, C, D, and E.

Diet history (Choice A) may be useful in identifying hypothyroidism secondary to iodine deficiency. Iodine deficiency in infancy is rare in the developed world, as adequate quantities of iodine are usually found in breast milk and infant formula.

Upper gastrointestinal series (Choice C) and rectal biopsy (Choice E) are useful in the assessment of constipation caused by gastric motility disorders or obstruction, particularly congenital megacolon (Hirschsprung disease). Congenital megacolon (Hirschsprung disease) is caused by the congenital absence of the distal portion of the colonic myenteric plexus. This often leads to an inability to pass meconium within the first few days of life and may result in a large bowel obstruction.

Cranial ultrasonography (Choice D) is useful for the diagnosis of intracranial hemorrhage in infants or certain structural abnormalities such as agenesis of the corpus callosum. It is not useful for the diagnosis of congenital hypothyroidism.

Educational Objective: Congenital hypothyroidism presents in the first few months of life with feeding difficulties, lethargy, constipation, myxedematous facies, macroglossia, large fontanelles, hypotonia, and hypothermia. It is typically identified on routine newborn screening. Thyroid function tests will confirm the diagnosis.

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✓ 39. A 32-year-old man comes to the office for a routine examination. He was diagnosed with HIV infection 7 years ago and began antiretroviral therapy 6 years ago. He received the appropriate immunizations at the time of diagnosis. He has tolerated his medication regimen well. He used illicit intravenous drugs for 5 years but stopped 7 years ago. He is in a monogamous relationship with one female partner; they use condoms consistently. Examination shows no abnormalities. His CD4+ T-lymphocyte count is 645/mm^3 (Normal≥500), and plasma HIV viral load is 1000 copies/mL. Which of the following immunizations is most appropriate to administer at this time?

A) Hepatitis A
B) Hepatitis B
C) Human papillomavirus
D) Meningococcal
E) Pneumococcal

Correct Answer: E.

Per the Advisory Committee on Immunization Practices (ACIP) guidelines, the pneumococcal vaccine is the most appropriate immunization to administer at this time. For immunocompetent adults, a single dose of the pneumococcal polysaccharide (PPSV23) vaccine is recommended at age 65 years or older. Current guidelines recommend shared decision making between the patient and clinician regarding the addition of pneumococcal conjugate (PCV13) doses. Special situations in which the PPSV23 vaccine is recommended for patients younger than 65 years include significant chronic medical conditions (eg, diabetes, congestive heart failure, pulmonary disease) or immunocompromised status. For patients with immunocompromising conditions, a PCV13 dose followed by a series of PPSV23 doses is recommended.

Incorrect Answers: A, B, C, and D.

Patients with HIV are at increased risk for severe disease and mortality from infection, and the patient presumably already received hepatitis A (Choice A), hepatitis B (Choice B), human papillomavirus (Choice C), and meningococcal (Choice D) vaccines. These are recommended and were likely administered at the time of diagnosis, along with the first dose in the pneumococcal series. The hepatitis A and B vaccines may be given in combination or separately as a two- or three-dose series during the course of 1 to18 months. Meningococcal vaccination is recommended to be repeated every 5 years for patients who remain at an increased risk for exposure.

Educational Objective: Pneumococcal vaccination is recommended for all adult patients with HIV regardless of age. The initial series consists of a PCV13 dose followed by a PPSV23 dose at least 8 weeks later. Revaccination with PPSV23 is recommended at least 5 years after the initial series, and again at age 65 years.

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40. A 24-year-old man with protein C deficiency comes to the physician because of a 1-week history of yellowing of his skin. Three months ago, he had a mesenteric infarction and required resection of all but 45 cm of the proximal small bowel. The remainder of the jejunum was anastomosed to the colon. He receives total parenteral nutrition at home. He takes no medications. Examination today shows generalized jaundice. Laboratory studies show:

Leukocyte count	7000/mm^3
Serum	
Bilirubin, total	3.6 mg/dL
Direct	2.6 mg/dL
Alkaline phosphatase	150 U/L
AST	20 U/L
ALT	17 U/L

Which of the following is the most likely cause of this patient's hyperbilirubinemia?

A) Biliary stricture
B) Cholestatic hepatic disease
C) Hemolysis
D) Hepatitis A
E) Hepatitis C

Correct Answer: B.

Cholestatic hepatic disease is identified by a disproportionate rise in bilirubin and alkaline phosphatase compared to AST and ALT. Cholestasis is accompanied by jaundice, visible at a bilirubin concentration of 2 mg/dL or greater, and pruritus. Biliary motility is triggered by oral intake and neurohormonal control stimulated in part by feeding and gastric motility. A lack of oral intake, such as in cases of total parenteral nutrition (TPN), with resultant limited gastric emptying will also cause limited biliary drainage and limited gallbladder contractility. In addition, TPN can cause bile duct inflammation, fibrosis, and biliary obstruction, which describes the clinical picture of cholestasis. TPN-induced cholestasis is more common in patients with a short bowel. Cholestasis is defined by increased indirect and/or direct bilirubin caused by the inability to excrete bilirubin. Typically, liver transaminases and alkaline phosphatase concentrations are not increased. Management of this condition involves discontinuing TPN and providing enteral feeding.

Incorrect Answers: A, C, D, and E.

Biliary strictures (Choice A) create physical obstructions to emptying and are often seen in the setting of biliary duct disease, such as primary biliary cirrhosis (PBC) or primary sclerosing cholangitis (PSC). Eventually, biliary strictures lead to hepatic fibrosis and end-stage liver failure with resultant ascites, splenomegaly, esophageal varices, and hepatic encephalopathy. They would not necessarily be correlated with administration of TPN and limited oral intake independent of other hepatobiliary pathology such as PBC, PSC, or other biliary inflammatory disease states.

Hemolysis (Choice C) leads to the release and subsequent degradation of hemoglobin, a byproduct of which is bilirubin. It leads to a largely unconjugated hyperbilirubinemia barring any concomitant downstream biliary obstruction.

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Hemolysis (Choice C) leads to the release and subsequent degradation of hemoglobin, a byproduct of which is bilirubin. It leads to a largely unconjugated hyperbilirubinemia barring any concomitant downstream biliary obstruction.

Hepatitis A virus (HAV) (Choice D) causes a self-limited infection that presents with nausea, vomiting, abdominal pain, icterus, hepatomegaly, and right upper quadrant tenderness that develops during several weeks following the ingestion of poorly cooked, improperly handled, or raw foods, such as shellfish. HAV is diagnosed by the serologic detection of anti-HAV IgM antibodies.

Hepatitis C infection (Choice E) can present in both acute and chronic forms. The acute variant typically presents with symptoms of fatigue, nausea, vomiting, jaundice, and right upper quadrant discomfort. If chronic infection ensues, it can eventually lead to cirrhosis and end-stage liver disease. Both hepatitis A and hepatitis C would cause transaminitis (generally a hepatocellular injury pattern, with transaminases increased out of proportion to alkaline phosphatase and bilirubin), which is not seen in this patient.

Educational Objective: Total parenteral nutrition (TPN), especially in patients with a short bowel and absent oral intake, can cause cholestatic hepatic disease, characterized by increased bilirubin and jaundice. Management of this condition involves discontinuing TPN and providing enteral feeding.

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41. Eight weeks after an uncomplicated vaginal delivery of a healthy full-term newborn, a 27-year-old woman, gravida 1, para 1, is brought to the physician by her husband because of a change in personality and depressed mood over the past 10 days. She has not had headaches. Her menses have not resumed despite the discontinuation of breast-feeding 5 weeks ago. Her husband says that she has no interest in sexual intercourse. She does not use illicit drugs. She has had a 2.7-kg (6-lb) weight gain since delivery. She is now 175 cm (5 ft 9 in) tall and weighs 74 kg (164 lb); BMI is 24 kg/m^2. Physical and neurologic examinations show no abnormalities. On mental status examination, she has a flat affect and is slow to respond to questioning. She spontaneously cries during the interview and examination. She has no suicidal ideation. Which of the following is the most appropriate next step in management?

A) MRI of the brain
B) Antipsychotic therapy
C) Cyclic progestin therapy
D) Estrogen therapy
E) Selective serotonin reuptake inhibitor therapy

Correct Answer: E.

Postpartum depression (PPD), now known as major depressive disorder with peripartum onset, presents with the typical symptoms of major depressive disorder (eg, depressed mood, decreased energy, anhedonia, sleep disturbances, appetite disturbances, poor concentration) and may be delayed by as many as 12 months after delivery. Risk factors include sleep disturbance, childcare stress, decreased estrogen concentrations, breast-feeding difficulty, body image dissatisfaction, and poor postpartum social support. Consequences can be severe and include impaired bonding with the child, developmental delays in the child, child neglect, suicide, and infanticide. The relative prevalence and severe consequences of PPD necessitate proactive screening for depression in primary care settings. Initial treatment of moderate to severe cases is with selective serotonin reuptake inhibitors, which pose minimal risk to breast-feeding infants.

Incorrect Answers: A, B, C, and D.

MRI of the brain (Choice A) is unnecessary. MRI may show an empty sella in the setting of postpartum pituitary necrosis, which may present with a depressed mood. However, patients with postpartum pituitary necrosis typically have a history of hemorrhage or hypovolemic shock during or shortly after delivery, and typically present with evidence of hypopituitarism, including agalactorrhea, hypothyroidism, and adrenal insufficiency.

Antipsychotic therapy (Choice B) is useful for the treatment of postpartum psychosis, which may present with hallucinations, delusions, or bizarre or disorganized thinking, speech, or behavior. This patient does not display symptoms of psychosis.

Cyclic progestin therapy (Choice C) may actually increase the risk for PPD and should be used with caution in the postpartum period. By contrast, estrogen therapy (Choice D) is supported by preclinical and limited clinical data as useful for the treatment of PPD. However, this therapy is not yet supported by evidence from randomized clinical trials and remains experimental at this time.

Educational Objective: Postpartum depression presents with symptoms of major depressive disorder in the 12 months following delivery and can be associated with serious consequences such as suicide and infanticide. Any postpartum patient who demonstrates severe symptoms or expresses suicidal or homicidal ideation should be referred for emergency psychiatric evaluation. Initial treatment of moderate to severe cases is with selective serotonin reuptake inhibitors.

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42. A 32-year-old woman, gravida 3, para 2, at 37 weeks' gestation is admitted to the hospital in labor. Contractions occur every 3 minutes. She has gained 2.3 kg (5 lb) during the past week and has had occasional blurred vision. She has been otherwise healthy. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 20/min, and blood pressure is 150/110 mm Hg. Physical examination shows retinal arteriolar spasm and pedal edema. The fundus is midway between the umbilicus and xiphoid. The cervix is 3 cm dilated and 100% effaced; the vertex is at 0 station. Laboratory studies show:

Hemoglobin	12.5 g/dL
Leukocyte count	8000/mm^3
Platelet count	200,000/mm^3
Serum creatinine	1.2 mg/dL
Urine protein	2+

Which of the following is the most likely complication during labor?

A) Abruptio placentae
B) Amniotic fluid embolism
C) Arrest of labor
D) Maternal death
E) Uterine rupture

Correct Answer: A.

This patient's findings of hypertension, vision changes, weight gain, and lower extremity edema occurring after the 20th week of gestation are consistent with a diagnosis of preeclampsia. Preeclampsia is caused by an abnormality of the placental spiral arteries and poor trophoblastic invasion, which leads to placental hypoperfusion and the subsequent production of vasoactive hormones that cause generalized endothelial dysfunction, hypercoagulability, and vasospasm. Preeclampsia may lead to uteroplacental insufficiency that puts the fetus at risk for fetal growth restriction. If untreated, preeclampsia can progress to eclampsia, characterized by maternal seizures, which can have profoundly adverse outcomes. Additionally, preeclampsia increases the risk for abruptio placentae, or premature separation of the placenta from the uterus, which can lead to fetal exsanguination. Abruptio placentae most commonly presents with vaginal bleeding, severe uterine pain, and tetanic contractions. Thus, the most likely complication during labor for this patient is abruptio placentae based on her underlying preeclampsia.

Incorrect Answers: B, C, D, and E.

Amniotic fluid embolism (Choice B) is a rare complication of childbirth and occurs during or immediately after delivery as a result of amniotic fluid entering the maternal circulation. It presents with shortness of breath, altered mental status, hypoxia, and hypotension. Complications include disseminated intravascular coagulopathy, cardiovascular collapse, and maternal and/or fetal death. Preeclampsia is not generally a risk factor for amniotic fluid embolism.

Arrest of labor (Choice C) occurs when there is no cervical change for greater than 4 hours with adequate contractions or 6 hours with inadequate contractions. These cases are typically managed with cesarean delivery. This patient is multiparous, which puts her at a decreased risk for arrest of labor, and she has no other risk factors that would predispose her to it.

Maternal death (Choice D) can occur in severe cases of preeclampsia. If eclampsia occurs, it can lead to maternal stroke, cardiac arrest, renal failure, and death. However, this patient's preeclampsia is likely

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Maternal death (Choice D) can occur in severe cases of preeclampsia. If eclampsia occurs, it can lead to maternal stroke, cardiac arrest, renal failure, and death. However, this patient's preeclampsia is likely to be treated with magnesium, which would prevent the development of seizures and the associated consequences. Thus, abruptio placentae would be a more likely outcome than maternal death.

Uterine rupture (Choice E) is a dangerous obstetric complication where the uterine wall tears, presenting with acute pain and both maternal and fetal hemodynamic instability. The sudden loss of fetal station is a suggestive finding. Risk factors include prior cesarean delivery or uterine surgery.

Educational Objective: Preeclampsia is caused by abnormalities of the placental spiral arteries and poor trophoblastic invasion, which leads to placental hypoperfusion and production of vasoactive hormones that cause generalized endothelial dysfunction, hypercoagulability, and vasospasm. Preeclampsia may lead to uteroplacental insufficiency that puts the fetus at risk for fetal growth restriction. It also increases the risk for abruptio placentae, which presents with vaginal bleeding, severe uterine pain, and tetanic contractions.

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43. A 32-year-old man is brought to the physician by his wife because of a gradual change in personality during the past 2 years. She describes him as less motivated and more self-centered. During the past year, he has had several angry outbursts that were triggered by minor events. The patient says that he does not believe his personality has changed and that he does not recall these events. He is alert and attentive. On examination, eye movements are full, but saccadic eye movements are noticeably slow. Smooth pursuit and vestibular ocular movements are normal. He has occasional involuntary rapid, jerk-like movements of the trunk and extremities, but he is unaware of these movements. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) EEG
B) Follow-up examination in 1 month
C) Genetic testing
D) Lumbar puncture
E) Measurement of serum ceruloplasmin concentration
F) Psychiatric assessment

Correct Answer: C.

Genetic testing will likely confirm a diagnosis of Huntington disease (HD), which is a hereditary, progressive neurodegenerative disorder typically arising in the third to sixth decades of life. The disease usually presents with an insidious onset of psychiatric (eg, irritability, depression, psychosis) and cognitive symptoms. Motor symptoms (eg, chorea, hypotonia, dystonia, loss of voluntary control of movements) typically appear later in the disease course. People with HD typically die 10 to 40 years after disease onset. Chorea, a key HD symptom, can be initially experienced as restlessness. Chorea is distinguished by irregular, unpredictable muscle movements that tend to flow from one muscle group to another. Treatment is symptomatic and can include tetrabenazine or deutetrabenazine, which target chorea by depleting dopamine stores. HD is caused by expansion of a trinucleotide repeat (CAG) on chromosome 4, which occurs when a series of three nucleotides in repetition are replicated incorrectly and too many repeats are included in the replicated product. HD also demonstrates anticipation, a genetic inheritance phenomenon in which future generations are affected at a younger age or with more severe symptoms.

Incorrect Answers: A, B, D, E, and F.

EEG (Choice A) is unlikely to provide useful information in this case. The patient's involuntary movements are more consistent with chorea than with epilepsy.

Follow-up examination in 1 month (Choice B) is not appropriate at this time given the impact of the patient's symptoms and abnormalities noted on neurologic examination. Obtaining a diagnosis is important so appropriate management can be initiated.

Lumbar puncture (Choice D) can be useful in patients presenting with nonspecific cognitive, behavioral, or neurologic symptoms to rule out central nervous system (CNS) infections such as neurosyphilis. It can also aid in the diagnosis of CNS malignancies, multiple sclerosis, Guillain-Barré syndrome, and subarachnoid hemorrhage.

Measurement of serum ceruloplasmin concentration (Choice E) is used in the diagnosis of hepatolenticular degeneration (Wilson disease), which can be difficult to distinguish clinically from HD. Patients typically present between childhood and early 30s. Neurologic symptoms are frequently encountered and include dysarthria, gait abnormalities, dystonia, tremor, parkinsonism, chorea, or athetosis. Kayser-Fleischer rings are a classical finding on ophthalmologic examination.

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Psychiatric assessment (Choice F) may benefit the patient if the diagnostic workup for organic disease is inconclusive. Laboratory and genetic testing for neurologic disorders should be performed first.

Educational Objective: Huntington disease is a hereditary, progressive neurodegenerative disorder associated with expansion of a trinucleotide repeat (CAG) on chromosome 4. It presents with insidious onset of psychiatric and cognitive symptoms, followed by motor symptoms (eg, chorea, hypotonia, dystonia, loss of voluntary control of movements). Diagnosis can be confirmed with genetic testing.

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44. A 12-year-old girl is brought to the physician by her mother because of a 2-month history of increasing, constant, throbbing pain and pressure in the pelvic area. She has no history of serious illness and takes no medications. She has never had a menstrual period. She follows a normal diet and takes gymnastics lessons weekly. She is at the 50th percentile for height, weight, and BMI. Vital signs are within normal limits. Breast and pubic hair development are sexual maturity rating (SMR) stage 3. Examination of the external genitalia shows a bluish bulge of tissue between a normal-appearing urethra and anus. Serum studies show:

Follicle-stimulating hormone	12 mIU/mL
Luteinizing hormone	15 mIU/mL
Estradiol	50 pg/mL (N=30–400)
Prolactin	10 ng/mL

Which of the following is the most likely diagnosis?

A) Bartholin duct cyst
B) Cervical stenosis
C) Imperforate hymen
D) Ovarian cancer
E) Sarcoma botryoides

Correct Answer: C.

The hymen is a thin membranous band of tissue that covers the introitus, or vaginal opening, in young females. In most cases, this tissue degrades and stretches sufficiently enough to allow drainage of blood and discharge by the time patients reach puberty. However, an imperforate hymen can occur when the hymen fails to regress. This results in the trapping of blood in a patient who has begun menstruation. The most common presentation is primary amenorrhea and cyclical, abdominopelvic pain. Classically, a hematocolpos, or a vaginal canal distended by blood, will be evident on examination. The diagnosis can be confirmed with ultrasonography, and treatment is with surgical hymenotomy.

Incorrect Answers: A, B, D, and E.

Bartholin duct cyst (Choice A) may present with a bulge of tissue on pelvic examination. A cyst results from an obstructed Bartholin gland, which is a gland located on each side of the introitus that provides secretions to lubricate the vagina. Bartholin duct cysts do not cause amenorrhea or abdominopelvic pain.

Cervical stenosis (Choice B), or narrowing of the cervical os at the entrance to the uterus, can cause symptoms like the ones seen in this patient. If the os was completely stenosed, it would result in blood accumulating in the uterus, causing persistent lower abdominal pain. However, cervical stenosis would not cause the bulging mucosal tissue seen on the examination of this patient.

Ovarian cancer (Choice D) is uncommon in premenstrual patients. When present, it is often a germ cell tumor or sex cord-stromal tumor. Patients commonly present with abdominopelvic pain, bloating, and nausea, with ultrasonography showing an ovarian mass. While these tumors can cause hormonal fluctuations, they are not associated with hematocolpos.

Sarcoma botryoides (Choice E) is a rare malignancy formed by striated muscle cells. It is often found in infants and children under the age of 3 years and presents with vaginal bleeding. Its name comes from the grape-like appearance of polypoid tissue. This patient is outside the expected age range for this malignancy and is presenting with amenorrhea, making this an unlikely diagnosis.

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Educational Objective: An imperforate hymen occurs when a thin band of membranous tissue over the introitus fails to regress during childhood. It presents during puberty with apparent amenorrhea and cyclical abdominopelvic pain. Classically, a hematocolpos, or a vaginal canal distended by blood, will be evident on examination. The diagnosis can be confirmed with ultrasonography, and treatment is with surgical hymenotomy.

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45. A 9-year-old girl is brought to the physician by her father for a well-child examination. He is concerned that she is beginning to develop breasts at an early age. Menarche has not occurred. Her mother's menarche began at the age of 12 years. The patient is at the 75th percentile for height and 50th percentile for weight. Breast development is sexual maturity rating (SMR) stage 2, and pubic hair development is SMR stage 1. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Reassurance
B) Measurement of serum estrogen concentration
C) Measurement of serum follicle-stimulating hormone concentration
D) X-ray of the wrist to assess bone age
E) Transvaginal ultrasonography
F) Pelvic examination

Correct Answer: A.

Puberty refers to the normal hormonal and physiologic changes that occur as children age. The most common age range for the onset of puberty in females is age 9 to 12 years, although this can vary markedly between patients based on factors such as body weight, genetics, and ethnicity. Precocious puberty refers to the onset of sexual secondary characteristics before age 8 in females or age 9 in males. It can be idiopathic or caused by a variety of etiologies, such as central nervous system lesions, ovarian or germ cell tumors, adrenal disorders, or genetic defects, such as McCune-Albright syndrome. Normal pubertal development in females often starts with breast development, followed by pubic hair development and menarche. This patient is progressing through normal pubertal milestones at an appropriate age, and no further workup is currently necessary, making reassurance the most appropriate next step in management.

Incorrect Answers: B, C, D, E, and F.

Measurement of serum estrogen concentration (Choice B) and the measurement of serum follicle-stimulating hormone concentration (Choice C) may be appropriate in the evaluation of precocious puberty, in addition to a thorough history and physical examination. Additional considerations for evaluation include measurement of bone age and serum concentrations of luteinizing hormone and testosterone. This patient is progressing through normal pubertal development and further evaluation is not necessary.

X-ray of the wrist to assess bone age (Choice D) is often used in the evaluation of precocious puberty. Advancements in bone age greater than two standard deviations from chronologic age are more likely to correspond to central or peripheral precocious puberty. Further determination of bone age in this patient is not necessary as she is progressing through normal puberty.

Transvaginal ultrasonography (Choice E) and pelvic examination (Choice F) are invasive ways to examine the patient's genitalia and reproductive system. While imaging of the pelvis, more commonly with abdominal ultrasonography, and examination of the external genitalia to determine sexual maturity rating are frequently utilized in the evaluation of precocious puberty, these measures are invasive and unnecessary in this patient. Additionally, these invasive examinations are not commonly recommended in patients her age, even in the setting of precocious puberty.

Educational Objective: Normal pubertal development most commonly occurs between ages 9 and 12 years in females. Puberty typically begins with breast development, followed by pubic hair development and menarche. The development of secondary sexual characteristics prior to age 8 in females is referred to as precocious puberty and warrants further evaluation with a thorough history and physical examination as well as laboratory evaluation. Normal pubertal development does not require additional workup.

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46. A 57-year-old man comes to the physician because of a 1-week history of shortness of breath and swelling of his legs. He says his shortness of breath occurs most frequently when he lies down. During the past month, he has had the sensation of abdominal fullness and pulling and has noticed a progressive increase in his belt size. Five years ago, he received the diagnosis of bleeding esophageal varices and alcoholic cirrhosis. He underwent sclerosis of the varices and has abstained from alcohol since then. His temperature is 36.9°C (98.4°F). The abdomen is moderately tense and nontender with shifting dullness. There is 3+ pitting edema of the lower extremities. Paracentesis is performed. Laboratory studies show:

Serum	
Protein, total	2.8 g/dL
Albumin	1.8 g/dL
Peritoneal fluid	
Leukocyte count	900/mm^3
Segmented neutrophils	67%
Lymphocytes	28%
Protein, total	1.8 g/dL
Albumin	1 g/dL

Which of the following is the most appropriate next step in management?

A) Echocardiography
B) Ultrasonography of the hepatic veins
C) Antibiotic therapy
D) Laparoscopy
E) Liver biopsy
F) CT angiography of the liver

Correct Answer: C.

Spontaneous bacterial peritonitis (SBP) occurs most frequently in cirrhotic states, although it can occur in any setting causing ascites. SBP is an infection within ascitic fluid in the peritoneal cavity, most often from translocated enteric flora such as *Escherichia coli*. The classic presentation includes fever with diffuse abdominal pain and tenderness in a patient with ascites. If there is clinical concern for SBP, the ascites fluid should be sampled through a paracentesis. Laboratory analysis of the ascitic fluid should include Gram stain, culture, and cell counts. A total leukocyte count of greater than 1000/mm^3, or greater than 250 neutrophils/mm^3, is generally diagnostic of SBP since culture results are variably positive. Antibiotics with gram-negative rod coverage (eg, third-generation cephalosporins) are considered first-line therapy.

Incorrect Answers: A, B, D, E, and F.

Echocardiography (Choice A) does not have a defined role in the evaluation of liver disease or SBP as it solely evaluates the heart and pericardium. If heart failure was also suspected, echocardiography would be appropriate.

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Incorrect Answers: A, B, D, E, and F.

Echocardiography (Choice A) does not have a defined role in the evaluation of liver disease or SBP as it solely evaluates the heart and pericardium. If heart failure was also suspected, echocardiography would be appropriate.

Ultrasonography of the hepatic veins (Choice B) can be helpful in diagnosing Budd-Chiari syndrome, which is characterized by acute onset of severe right upper quadrant pain, congestive hepatopathy, and liver failure caused by obstruction of the hepatic veins by thrombosis. However, in cases with evidence of SBP, administration of antibiotics should not be delayed.

Laparoscopy (Choice D) would not be appropriate in cases of ascites without suspicion for a competing diagnosis warranting its use (eg, bowel perforation, cholecystitis).

Liver biopsy (Choice E) is useful in the diagnosis of conditions such as cirrhosis, hepatitis, and hepatocellular carcinoma. While it can be helpful in diagnosing the cause of cirrhosis, it should not delay antibiotic administration when SBP is known.

CT angiography of the liver (Choice F) would not be helpful in the diagnosis or treatment of SBP. CT angiography is used in a variety of clinical presentations to assess the patency, course, and integrity of blood vessels, most commonly in thromboembolic disease, atherosclerotic disease, or bleeding.

Educational Objective: Spontaneous bacterial peritonitis is diagnosed when paracentesis fluid shows a total leukocyte count of greater than 1000/mm^3 or greater than 250 neutrophils/mm^3. If diagnosed, antibiotic therapy should be initiated.

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47. An asymptomatic 62-year-old man comes for a routine health maintenance examination. Physical examination shows splenomegaly. Laboratory studies show:

Hematocrit	42%
Leukocyte count	46,000/mm^3
Segmented neutrophils	35%
Bands	15%
Basophils	1%
Lymphocytes	16%
Monocytes	5%
Myeloblasts	1%
Promyelocytes	2%
Metamyelocytes	13%
Myelocytes	12%
Platelet count	650,000/mm^3

Leukocyte alkaline phosphatase activity is decreased. Examination of bone marrow shows many immature white blood cell precursors. Which of the following is the most likely diagnosis?

A) Agnogenic myeloid metaplasia
B) Chronic myelogenous leukemia
C) Chronic myelomonocytic leukemia
D) Erythroleukemia
E) Essential thrombocytosis
F) Myelodysplasia
G) Polycythemia vera

Correct Answer: B.

The patient most likely has a diagnosis of chronic myelogenous leukemia (CML), which commonly presents as an incidental laboratory finding in asymptomatic patients. The chronic phase may also present with fatigue, night sweats, weight loss, splenomegaly, and fever. CML is defined by the Philadelphia (Ph1) chromosome (translocation between chromosomes 9 and 22). Typical laboratory findings in CML include hyperleukocytosis, which is present in this case, with an increase in nearly all the myeloid cell lines. Leukostasis, a condition in which hyperleukocytosis leads to end-organ damage from occlusion of capillaries by malignant, nondistensible cells, is uncommon in CML because malignant cells are well-differentiated and pliable. This contrasts with conditions such as acute myeloid leukemia and acute lymphocytic leukemia in which circulating blasts, which are large and not particularly pliable, easily lodge in capillaries to cause pulmonary and neurologic complications. Treatment of CML is primarily with tyrosine kinase inhibitors such as imatinib or dasatinib and routine laboratory monitoring.

Incorrect Answers: A, C, D, E, F, and G.

Agnogenic myeloid metaplasia (Choice A), also called idiopathic or primary myelofibrosis, is the least common of the chronic myeloproliferative disorders and is associated with increased leukocyte alkaline

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D) Erythroleukemia
E) Essential thrombocytosis
F) Myelodysplasia
G) Polycythemia vera

Correct Answer: B.

The patient most likely has a diagnosis of chronic myelogenous leukemia (CML), which commonly presents as an incidental laboratory finding in asymptomatic patients. The chronic phase may also present with fatigue, night sweats, weight loss, splenomegaly, and fever. CML is defined by the Philadelphia (Ph1) chromosome (translocation between chromosomes 9 and 22). Typical laboratory findings in CML include hyperleukocytosis, which is present in this case, with an increase in nearly all the myeloid cell lines. Leukostasis, a condition in which hyperleukocytosis leads to end-organ damage from occlusion of capillaries by malignant, nondistensible cells, is uncommon in CML because malignant cells are well-differentiated and pliable. This contrasts with conditions such as acute myeloid leukemia and acute lymphocytic leukemia in which circulating blasts, which are large and not particularly pliable, easily lodge in capillaries to cause pulmonary and neurologic complications. Treatment of CML is primarily with tyrosine kinase inhibitors such as imatinib or dasatinib and routine laboratory monitoring.

Incorrect Answers: A, C, D, E, F, and G.

Agnogenic myeloid metaplasia (Choice A), also called idiopathic or primary myelofibrosis, is the least common of the chronic myeloproliferative disorders and is associated with increased leukocyte alkaline phosphatase activity. The patient's serum discloses decreased leukocyte alkaline phosphatase activity.

Chronic myelomonocytic leukemia (Choice C) is a hematologic disorder that displays both neoplastic and proliferative behavior. Laboratory studies are notable for a predominant monocytosis, which is not present in this patient's sample.

Erythroleukemia (Choice D) is a subtype of acute myeloid leukemia characterized by proliferation of immature erythrocytes. Leukopenia is disclosed on laboratory studies rather than leukocytosis as in this case, as well as anemia and thrombocytopenia.

Essential thrombocytosis (Choice E) is characterized by abnormal platelet proliferation, which are often dysfunctional leading to hemorrhagic and thrombotic complications. Bone marrow examination would be expected to show proliferation of megakaryocytes rather than white blood cell precursors.

Myelodysplasia (Choice F) is frequently encountered in older individuals or in those who previously received cytotoxic chemotherapy. Findings on bone marrow aspirate include abnormal appearing cells of multiple lineages, which are not present on this patient's bone marrow biopsy.

Polycythemia vera (Choice G) is associated with *JAK2* mutations that lead to unregulated myeloproliferation and erythrocytosis. Presenting symptoms are often related to increased blood viscosity and include headaches, visual disturbances, and erythromelalgia (burning pain in the digits). It is also associated with pruritus caused by hot showers.

Educational Objective: Chronic myelogenous leukemia is a common myeloproliferative disorder encountered in older adults, caused by the reciprocal translocation between chromosomes 9 and 22 known as the Philadelphia (Ph1) chromosome. In the chronic phase, patients present with nonspecific symptoms and have laboratory studies that disclose proliferation of white blood cells and their precursors.

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✓ 48. A 5-year-old boy is brought to the office for a follow-up examination 2 days after he was discharged from the hospital following an episode of pyelonephritis. Medications are cefixime and acetaminophen. He is at the 50th percentile for height and 25th percentile for weight; BMI is at the 10th percentile. Temperature is 37.6°C (99.6°F), pulse is 120/min, respirations are 22/min, and blood pressure is 90/60 mm Hg. Physical examination shows no other abnormalities. Results of laboratory studies from his hospital admission showed a leukocyte count within the reference range and urine positive for leukocyte esterase; urine culture grew *Klebsiella pneumoniae* susceptible to cephalosporins. Kidney ultrasonography showed mild hydronephrosis. Which of the following is the most appropriate next step in management?

A) Continuous antibiotic prophylaxis
B) Kidney and bladder ultrasonography
C) Renal scintigraphy using dimercaptosuccinic acid (DMSA)
D) Repeat urine culture
E) Voiding cystourethrography

Correct Answer: E.

Among children who present with an initial episode of febrile urinary tract infection (UTI), it is essential to identify factors that may predispose the patient to recurrent infections. Recurrent UTI increases the risk for renal scarring, hydronephrosis, and chronic kidney disease. Vesicoureteral reflux (VUR) is characterized by incomplete closure of the vesicoureteral junction during voiding with retrograde flow of urine from the bladder to the ureters. VUR allows for retrograde transport of bacteria to the upper urinary tract and is a significant risk factor for pyelonephritis. Voiding cystourethrography (VCUG) is indicated for children with a first febrile UTI if there is evidence of hydronephrosis, renal scarring, or other findings that are suggestive of VUR. VCUG involves instillation of contrast dye into the bladder via catheterization, which allows for visualization of reflux during voiding.

Incorrect Answers: A, B, C, and D.

Continuous antibiotic prophylaxis (Choice A) is indicated for children with VUR, although this remains controversial. Antibiotics are not routinely given prior to the diagnosis of VUR with VCUG.

Kidney and bladder ultrasonography (Choice B) is useful for identifying hydronephrosis and abnormal ureteral architecture but is not reliable for the detection of VUR.

Renal scintigraphy using dimercaptosuccinic acid (DMSA) (Choice C) is a method of detecting renal scarring via the intravenous injection of a radiotracer. It is not recommended as the initial test to diagnose sequelae from VUR because it involves greater radiation exposure and is more expensive.

Repeat urine culture (Choice D) is not useful for identifying VUR or risk-stratification of recurrent pyelonephritis.

Educational Objective: Vesicoureteral reflux (VUR) is characterized by incomplete closure of the vesicoureteral junction during voiding with retrograde flow of urine from the bladder to the ureters. VUR is a significant risk factor for pyelonephritis, which may have long-lasting sequelae including renal scarring, hydronephrosis, and chronic kidney disease. Voiding cystourethrography is indicated for children with unexplained urinary tract infection if there is evidence of hydronephrosis, renal scarring, or other findings that are suggestive of VUR.

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49. A 16-year-old girl is brought to the emergency department immediately after she collapsed on her way to the bathroom at home. She has anorexia nervosa and has had an 18-kg (40-lb) weight loss during the past 16 months. Menarche was at the age of 11 years, but her last menstrual period was 14 months ago. She does not drink alcohol or use illicit drugs. On arrival, she appears cachectic. She is 165 cm (5 ft 5 in) tall and weighs 36 kg (80 lb); BMI is 13 kg/m^2. Her temperature is 36.4°C (97.6°F), pulse is 40/min, respirations are 18/min, and blood pressure is 85/55 mm Hg. Physical examination shows fine hair over the skin. An ECG shows ST-segment depression and an increased U wave. This patient is most likely to have which of the following sets of serum electrolyte findings?

	Na^+ (mEq/L)	K^+ (mEq/L)	Cl^- (mEq/L)	HCO_3^- (mEq/L)
A)	125	3.2	102	25
B)	125	6.8	102	27
C)	140	2.3	94	28
D)	140	6.8	94	28
E)	155	3.2	102	26

Correct Answer: C.

Anorexia nervosa is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and restriction of food or binge eating and purging behavior. Patients with anorexia nervosa often have a BMI less than 17 kg/m^2 (below the 5th percentile). As a result of insufficient nutrition and weight loss, the hypothalamus decreases gonadotropin-releasing hormone secretion, which leads to amenorrhea and pubertal delay or arrest. The physical examination can show dry, scaly skin, and fine hair or hair loss. Patients with the binge-eating/purging type of anorexia nervosa will also have tooth decay from gastric hydrochloric acid erosion of enamel and scars on the knuckles secondary to abrasions from incisors when inducing vomiting. Losses of gastric hydrochloric acid lead to hypochloremia and metabolic alkalosis. Gastric losses of potassium also result in hypokalemia. However, this is further exacerbated by renal losses of potassium as a result of alkalosis. In severe cases, signs of hypovolemia such as tachycardia and hypotension may be present. Treatment of anorexia is through a combined medical and psychiatric approach and involves correcting fluid and electrolyte derangements alongside behavioral and pharmacologic therapy.

Incorrect Answers: A, B, D, and E.

Hyponatremia (Choices A and B) and hypernatremia (Choice E) are not generally features of anorexia nervosa apart from severe volume depletion or water consumption. Hyponatremia can occur in syndrome of inappropriate antidiuretic hormone. Severe hyponatremia may be accompanied by seizures, confusion, coma, or death. In addition, renal excretion of potassium leads to hypokalemia, not normokalemia (Choices A and E) or hyperkalemia (Choices B and D).

Educational Objective: Patients with anorexia nervosa (binge-eating/purging type) have low BMI, pubertal delay or arrest, and purging behavior leading to hypovolemia and electrolyte disturbances of hypokalemia, hypochloremia, and metabolic alkalosis.

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50. A 20-hour-old female newborn was noted to have jaundice 1 hour ago. She was born at term to a 29-year-old woman, gravida 2, para 2, following an uncomplicated pregnancy and spontaneous vaginal delivery. The mother emigrated from Ethiopia 2 years ago. She received routine prenatal care. Examination of the patient shows jaundice to the level of the umbilicus. There is conjunctival icterus. No other abnormalities are noted. The maternal blood group is O, Rh-positive. Results of laboratory studies, including the patient's blood group, are pending. Which of the following laboratory findings is most likely to be decreased in this patient?

A) Hematocrit
B) Leukocyte count
C) Platelet count
D) Serum direct bilirubin concentration
E) Serum indirect bilirubin concentration

Correct Answer: A.

Hemolytic disease of the newborn can be caused by red blood cell antigen alloimmunization in the mother. While this most commonly involves the Rh(D) antigen, hemolysis can also occur as a result of the incompatibility of other red blood cell antigens, such as the A and B antigens. This is of particular concern in mothers with blood group O blood who have antibodies against A and B. This incompatibility can result in hemolytic anemia of the newborn, as seen in this patient, caused by the transposition of these IgG antibodies across the placenta and their subsequent attack of newborn erythrocytes. Thus, this patient with profound jaundice born to a multiparous mother with blood group O blood is most likely to have decreased hematocrit on laboratory evaluation as a result of hemolysis.

Incorrect Answers: B, C, D, and E.

Leukocyte count (Choice B) would not be decreased in this patient. As the maternal antibodies are directed against A and B antigens on red blood cells, the white blood cells should not be affected.

Platelet count (Choice C) would not be decreased in this patient. As the maternal antibodies are directed against A and B antigens on red blood cells, the platelet count should not be affected.

Serum direct bilirubin concentration (Choice D) and serum indirect bilirubin concentration (Choice E) would likely be increased in the setting of hemolysis. However, given the newborn's limited conjugation system, the indirect bilirubin concentration would be increased to a greater degree than the direct concentration. The increased bilirubin concentration in this patient's serum is responsible for her jaundice.

Educational Objective: Hemolytic disease of the newborn can occur in children born to mothers with blood group O blood as a result of the transposition of IgG antibodies against A and B antigens across the placenta and their subsequent attack of newborn erythrocytes. Unlike Rh(D) isoimmunization, ABO incompatibility more commonly affects the newborn than the fetus. It presents postnatally with hemolysis and subsequent jaundice and anemia.

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1. A 48-year-old man is admitted to the hospital for management of acute respiratory failure. He has a 4-day history of fever, an increase in thick, yellow-green sputum production, and diffuse muscular aches. During the past 2 years, he has produced 2 to 3 tablespoons of yellow sputum daily. He has smoked two packs of cigarettes daily for 30 years. He is 183 cm (6 ft) tall and weighs 134 kg (295 lb); BMI is 40 kg/m^2. On admission, his temperature is 38.6°C (101.5°F), pulse is 120/min, respirations are 30/min, and blood pressure is 170/100 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 60%. On admission, an AP portable x-ray shows bilateral diffuse interstitial infiltrates without consolidation. He does not respond to high-flow oxygen therapy. He is intubated and mechanically ventilated. Examination shows hyperresonance to percussion and wheezes bilaterally. Ceftriaxone and levofloxacin are administered, and his symptoms improve. On hospital day 4, he is extubated. His temperature is 37.6°C (99.7°F), pulse is 100/min, respirations are 22/min, and blood pressure is 150/96 mm Hg. Pulse oximetry while sitting shows an oxygen saturation greater than 95%. Six hours later, the patient's oxygen saturation is 86%. The patient is lying in bed and says he feels fine. Physical examination shows no wheezing, crackles, or rhonchi. There is no peripheral edema. A repeat chest x-ray shows improvement. Which of the following is the most appropriate next step in management to improve this patient's oxygen saturation?

A) Increase the oxygen concentration of inspired air
B) Increase the positive end-expiratory pressure
C) Place the patient in Trendelenburg position
D) Place the patient's head on three pillows
E) Return the patient to a sitting position

Correct Answer: E.

Intubation and mechanical ventilation are indicated in patients who are apneic, hypoxic, or hypercapnic; not responding to less invasive means; or are unable to protect their airway (eg, lethargic, no gag or cough reflex). After intubation and mechanical ventilation, patients may have a component of respiratory insufficiency caused by prolonged dependence on a ventilator. Respiratory muscles can atrophy, leading to respiratory insufficiency. In this patient, hypoxia is not caused by pulmonary edema, infection, or chronic obstructive pulmonary disease (COPD) exacerbation, and is likely caused by respiratory muscle atrophy after several days of intubation. Additionally, this patient has morbid obesity, which can cause respiratory insufficiency through mechanisms such as chest wall restriction when supine and suppression of central respiratory drive. Exercises such as pulmonary physiotherapy, repositioning to a sitting or standing position, and coughing can improve oxygenation and respiratory muscle use.

Incorrect Answers: A, B, C, and D.

Increasing the oxygen concentration of inspired air (Choice A), such as supplying oxygen via nasal cannula, would be a temporary measure to improve oxygenation but would not address the underlying respiratory insufficiency. The patient requires respiratory exercises and support to improve respiratory function.

Increasing the positive end-expiratory pressure (Choice B), such as with noninvasive positive pressure, would be indicated in cases of respiratory distress secondary to pulmonary edema or COPD exacerbation. This patient has no respiratory distress, wheezing, or rales.

Placing the patient in Trendelenburg position (Choice C) would not be helpful, as intra-abdominal contents and gravity would decrease lung compliance, worsening respiratory insufficiency.

Placing the patient's head on three pillows (Choice D) would be helpful in the management of orthopnea in cases of pulmonary edema, such as a heart failure exacerbation, provided that the torso was also somewhat elevated. This patient does not have rales, making this diagnosis unlikely.

Educational Objective: Mechanical ventilation can lead to respiratory muscle atrophy and insufficiency. Exercises such as physiotherapy, coughing, repositioning, and moving can improve respiratory sufficiency after mechanical ventilation.

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2. A 24-year-old female medical student sustains a deep laceration of her left index finger while assisting the surgeon during an operation on a patient with cervical cancer. The surgical patient has a history of multiple sexual partners and intravenous drug use; it is not yet known if she is HIV positive. Examination of the medical student shows a 2-cm, bleeding laceration; the bleeding stops with compression. Which of the following is the most appropriate next step in management pending results of HIV testing on the surgical patient?

A) Acyclovir therapy
B) Antiretroviral therapy
C) Corticosteroid therapy
D) Nafcillin therapy
E) No treatment is indicated

Correct Answer: B.

Occupational exposure to HIV is common in healthcare personnel as a result of needlestick injuries and other surgical injuries, such as small lacerations or punctures. The rate of seroconversion following accidental HIV exposure is low (estimated at approximately 0.25 to 0.35%). The risk for seroconversion is dependent upon several factors, including the patient's HIV viral load, the depth of injury, puncture with a hollow-bored as opposed to solid needle, or injury with a visibly contaminated instrument. Immediately following exposure, the area should be copiously washed with soap and water. Baseline and serial serologic testing for HIV should be performed at the time of exposure and up to 6 months following exposure. If unknown, the patient's HIV status should be determined immediately. Post-exposure prophylaxis should be instituted as soon as possible following a known or possible exposure to HIV. A variety of regimens are frequently employed, commonly a multidrug antiretroviral regimen including two nucleoside/nucleotide reverse transcriptase inhibitors, such as tenofovir or emtricitabine, and an integrase inhibitor, such as dolutegravir or raltegravir. All needlestick or surgical injuries should be reported promptly so that appropriate testing and follow up can be arranged.

Incorrect Answers: A, C, D, and E.

Acyclovir therapy (Choice A) is incorrect. Acyclovir is an inhibitor of viral DNA polymerase. It has little to no activity against HIV and is used primarily in the management of herpesvirus infections.

Corticosteroid therapy (Choice C) is incorrect. Administration of corticosteroids will result in immune suppression and is not helpful for reducing HIV transmission.

Nafcillin therapy (Choice D) is incorrect. Prophylactic systemic antibiotic therapy is not necessary following occupational injuries among healthcare personnel and is not useful for preventing transmission of HIV.

No treatment (Choice E) is incorrect. While the risk for seroconversion following a surgical or needle-stick exposure to HIV is low, the use of post-exposure prophylaxis is supported by high-quality evidence and minimizes the risk for HIV transmission.

Educational Objective: Occupational exposure to HIV is common in healthcare personnel as a result of needlestick injuries and surgical injuries, such as lacerations or punctures. The rate of seroconversion following accidental HIV exposure is low. Immediately following exposure, the area should be washed with soap and water. Post-exposure prophylaxis should be instituted following a known or possible exposure to HIV. Multidrug antiretroviral regimens including two nucleoside/nucleotide reverse transcriptase inhibitors and an integrase inhibitor are frequently employed.

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✓ 3. A 10-month-old female infant is brought to the office by her parents for a follow-up examination 3 weeks after undergoing staged repair of a left complete unilateral cleft lip and palate. The procedure and recovery were uncomplicated, and the infant was discharged home 2 days later. The parents report she is feeding well with a traditional bottle nipple and now also consumes some soft baby foods. She has not had fever, pain, or nasal regurgitation. She receives no medications. Today, she is at the 25th percentile for length and weight. Vital signs are normal. Physical examination discloses a well-healing surgical incision on the left upper vermilion and philtrum; the palate also appears to be healing well without wound dehiscence or palatal holes. This patient's parents should be informed that she is at increased risk for developing which of the following?

A) Chronic colonization with group A streptococcus
B) Dyslexia
C) Peritonsillar abscess
D) Severe myopia
E) Velopharyngeal insufficiency

Correct Answer: E.

Cleft lip and cleft palate may occur in either complete (extending through the nares) or incomplete (not involving the nares) fashions and may occur unilaterally or bilaterally. Cleft lip occurs from a failure of fusion of the maxillary and nasal prominences. Cleft palate occurs from a failure of fusion of the palatine prominences. Cleft lip and palate occur as isolated developmental anomalies or in the setting of chromosomal abnormalities (eg, Patau syndrome or trisomy 13) or syndromes of midfacial hypoplasia (eg, Treacher Collins syndrome). Treatment requires surgical repair. Velopharyngeal insufficiency (VPI) is a common sequela of cleft palate, with or without repair. VPI is defined as an inability to properly close the velopharyngeal port separating the nasopharynx and oropharynx during the production of speech, which is frequently caused by a shortened palate or persistent palatal defects. VPI can lead to high-pitched, hypernasal, or whistling speech with reduced intelligibility. Persistent or severe VPI may require additional surgical repair.

Incorrect Answers: A, B, C, and D.

Chronic colonization with group A streptococcus (Choice A) is typically not more common in children with cleft lip and palate. Some evidence has suggested that *Staphylococcus aureus* is more common in these children.

Dyslexia (Choice B) is incorrect. There is some evidence that children with cleft lip and palate, especially in association with syndromic causes, have higher rates of language disorders, including dyslexia, although this remains controversial.

Peritonsillar abscess (Choice C) is a localized collection of pus in the peritonsillar space and may occur following tonsillitis. It is not a common consequence of cleft lip and palate repair.

Severe myopia (Choice D) is less likely. While Stickler syndrome may present with myopia as well as cleft lip and palate, this is rare. VPI is a more common consequence of cleft palate either with or without surgical repair.

Educational Objective: Velopharyngeal insufficiency (VPI) is a common sequela of cleft palate, with or without surgical repair. VPI is defined as an inability to properly close the velopharyngeal port separating the nasopharynx and oropharynx during the production of speech, which is frequently caused by a shortened palate or persistent palatal defects. VPI can lead to high-pitched, hypernasal, or whistling speech with reduced intelligibility.

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4. A 22-year-old man is brought to the physician by his parents because he has become newly preoccupied with religion during the past year. He lives with his parents and attends a community college. Two months ago, he stopped attending his classes. His parents report that he spends most of the day in his room alone reading religious scripture. He shows no interest in activities he once enjoyed, no longer spends time with his friends, masturbates frequently and obviously, and spends most of the night walking around his room laughing and talking to himself. He has no history of serious illness and takes no medications. Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, he has a depressed mood and animated affect. His speech is pressured, and responses to questions are tangential. He reports hearing a voice during the past 2 months that he believes is "the voice of God." He says that he feels confused and has thoughts about ending his life because he cannot understand if God truly wants him to become the next Messiah. Which of the following is the most likely diagnosis?

A) Delusional disorder
B) Obsessive-compulsive disorder
C) Schizoid personality disorder
D) Schizophrenia
E) Schizotypal personality disorder

Correct Answer: D.

According to the DSM-5, patients with schizophrenia demonstrate at least two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, alogia). Many patients also illustrate prodromal periods of strange behavior and social withdrawal. To meet diagnostic criteria, patients must demonstrate functional deficits, and the total duration of symptoms must exceed 6 months. The cause is thought to include dopamine dysregulation, and brain imaging typically shows decreased cortical volume and enlarged ventricles. The treatment of schizophrenia is with antipsychotics, which can be divided into two groups: typical (haloperidol, fluphenazine, chlorpromazine) and atypical (risperidone, quetiapine, olanzapine).

Incorrect Answers: A, B, C, and E.

Delusional disorder (Choice A) features the presence of one or more delusions for a month or longer with no other symptoms of psychosis. The presence of hallucinations and disordered speech and behavior are more consistent with a diagnosis of schizophrenia.

Obsessive-compulsive disorder (Choice B) manifests with recurrent, intrusive urges or thoughts (obsessions) that the patient tries to relieve or neutralize by repetitive rituals (compulsions). Common symptom complexes revolve around cleanliness, symmetry, harm to self or others, taboo thoughts or ideas, and completeness. Symptoms are time-consuming, cause significant distress, and markedly impair functioning.

Schizoid personality disorder (Choice C), a cluster A personality disorder (the odd or eccentric cluster), manifests as extreme social detachment and a cold, restricted affect. In contrast to patients with schizophrenia, they do not typically display disorganized speech and behavior or experience hallucinations.

Schizotypal personality disorder (Choice E) is a cluster A personality disorder characterized by odd behavior and/or magical thinking and a constricted affect. Delusions, hallucinations, and disorganized speech and behavior, as in this patient, would be atypical for patients with schizotypal personality disorder.

Educational Objective: Schizophrenia is characterized by at least 6 months exhibiting two of the following five symptoms: delusions, hallucinations, disorganized speech, disorganized behavior, or negative symptoms (eg, flat affect, apathy, alogia).

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5. A 26-year-old primigravid woman has spontaneous rupture of the membranes at 30 weeks' gestation. She is afebrile and has no contractions. A sterile speculum examination shows a closed cervix and a pool of clear fluid in the vagina. Which of the following is the most likely complication?

A) Amniotic band syndrome
B) Fetal deformation
C) Fetal hypoplastic lungs
D) Preterm delivery
E) Umbilical cord occlusion

Correct Answer: D.

Premature rupture of membranes refers to the rupture of the amniotic sac before the onset of labor (regular contractions plus cervical change). If it occurs before 37 weeks' gestation, it is termed preterm premature rupture of membranes (PPROM). Patients typically report a gush of fluid or steady leakage of fluid from the vagina. Initial evaluation includes a sterile speculum examination of the vagina, which may show pooling of amniotic fluid or leakage of fluid from the cervical os. Nitrazine testing of the fluid will show a pH of 7.0 to 7.3, and ferning will be seen on microscopic examination. Ultrasonography can also be utilized to determine the amount of residual amniotic fluid, which would be decreased in the setting of the rupture of membranes. Risk factors include previous premature rupture of membranes, a vaginal or cervical infection, and cigarette smoking. Patients with PPROM are at increased risk for preterm delivery, as the rupture of membranes usually precipitates the onset of labor. Thus, these patients are treated with betamethasone to accelerate fetal lung maturity. Antibiotics are commonly administered prophylactically as a result of an increased risk for chorioamnionitis. The most likely complication in this patient presenting with PPROM is preterm delivery.

Incorrect Answers: A, B, C, and E.

Amniotic band syndrome (Choice A) occurs when a band of amniotic tissue compresses a portion of the developing fetus, which can cause limb defects and craniofacial abnormalities. It is often diagnosed prenatally on ultrasonography. Premature rupture of membranes is not a risk factor for its development.

Fetal deformation (Choice B) includes a variety of anatomic defects. While some of these may predispose the patient to preterm delivery, fetal defects are not a risk factor for PPROM. Similarly, PPROM is not known to cause fetal defects.

Fetal hypoplastic lungs (Choice C) can occur as a result of PPROM, as oligohydramnios prevents the development of the lungs with intrauterine fetal breathing. However, this is more common in neonates that are born at the extremes of prematurity and generally requires an amount time with oligo- or -anhydramnios beyond the duration from onset of PPROM to delivery. Additionally, this patient is not in labor which provides additional time for betamethasone to improve fetal lung maturity.

Umbilical cord occlusion (Choice E) can lead to fetal hypoxia and death if the compression is severe and ongoing. While severe oligohydramnios in the setting of rupture of membranes can predispose a fetus to umbilical cord compression, preterm labor is a more likely outcome of this patient's presentation.

Educational Objective: Preterm premature rupture of membranes (PPROM) refers to the rupture of the amniotic sac before the onset of labor and before 37 weeks' gestation. Risk factors include previous premature rupture of membranes, a vaginal or cervical infection, and cigarette smoking. Patients with PPROM are at increased risk for preterm delivery, as the rupture of membranes usually precipitates the onset of labor. For this reason, these patients are treated with betamethasone to accelerate fetal lung maturity.

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6. An 8-year-old African American girl with sickle cell disease is brought to the physician by her mother because of a 12-hour history of cough and difficulty breathing. Her medications are penicillin and folic acid. Her temperature is 39°C (102.2°F), pulse is 130/min, respirations are 40/min, and blood pressure is 105/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. On pulmonary examination, crackles are heard in the upper lobes. Breath sounds are decreased at the lung bases bilaterally. The remainder of the examination shows no abnormalities. An x-ray of the chest is shown. Which of the following is the most appropriate next step in diagnosis?

A) Anti-*Mycoplasma pneumoniae* IgG titer
B) Rapid antigen detection test for respiratory syncytial virus
C) Blood culture
D) Spiral CT scan of the chest
E) Thoracentesis

Correct Answer: C.

Patients with sickle cell disease (SCD) are at increased risk for rapidly progressive, life-threatening infections as a result of hyposplenia and accompanying immunocompromise. Acute chest syndrome (ACS)

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chest is shown. Which of the following is the most appropriate next step in diagnosis?

A) Anti-*Mycoplasma pneumoniae* IgG titer
B) Rapid antigen detection test for respiratory syncytial virus
C) Blood culture
D) Spiral CT scan of the chest
E) Thoracentesis

Correct Answer: C.

Patients with sickle cell disease (SCD) are at increased risk for rapidly progressive, life-threatening infections as a result of hyposplenia and accompanying immunocompromise. Acute chest syndrome (ACS) occurs as a result of vaso-occlusion within the pulmonary microvasculature and is diagnosed in patients with SCD who present with a new pulmonary infiltrate in the setting of fever or other new respiratory symptoms, including cough, shortness of breath, increased work of breathing, tachypnea, or hypoxemia. ACS is a leading cause of mortality in patients with SCD. While ACS is a distinct clinical syndrome, it is commonly precipitated by another illness such as bacterial or viral pneumonia, asthma exacerbation with hypoventilation, or fat emboli. Plain film x-rays typically show segmental or subsegmental consolidation, or a pleural effusion, with predilection for involvement of the lower lobes. It is both impractical and nearly impossible to distinguish ACS from bacterial pneumonia in patients with SCD. In patients with SCD who present with fever or ACS, obtaining blood cultures is essential to promptly identify bacteremia. Empiric antibiotic therapy should be initiated immediately after blood cultures are obtained and should not be delayed pending further workup. Further treatment involves analgesia, maintaining normoxia with supplemental oxygen or the use of noninvasive positive pressure ventilation, judicious use of fluids, and aggressive pulmonary hygiene measures, including the use of an incentive spirometer.

Incorrect Answers: A, B, D, and E.

Anti-*Mycoplasma pneumoniae* IgG titer (Choice A) is useful for identifying prior exposure to *Mycoplasma pneumoniae*. While patients with SCD are at increased risk for *M. pneumoniae* infection, mycoplasma infections are covered by empiric therapy, and antibody titers are often unnecessary.

Rapid antigen detection test for respiratory syncytial virus (Choice B) may be useful for the diagnosis of bronchiolitis, which presents with a viral prodrome of fever, nasal congestion, and rhinorrhea followed by cough, dyspnea, and lethargy. While evaluating for possible viral causes of ACS is important, obtaining blood cultures is more important, as bacteremia and sepsis can be acutely life-threatening.

Spiral CT scan of the chest (Choice D) is useful for the identification of pulmonary embolism, which is often not evident on plain film x-rays. While adults with SCD are at increased risk for venous thromboembolism in the setting of ACS, this complication is less frequent in children and if there is concern, it can be assessed after blood cultures are obtained.

Thoracentesis (Choice E) is useful for the diagnosis and management of a pleural effusion. While this patient's chest x-ray shows small pleural effusions, obtaining blood cultures is a more important immediate step for preventing morbidity and mortality.

Educational Objective: Patients with sickle cell disease are at increased risk for rapidly progressive, life-threatening infections as a result of hyposplenia and accompanying immunocompromise. Differentiating bacterial pneumonia from acute chest syndrome (ACS) is often impossible. Patients who present with fever or suspected ACS should be emergently evaluated with a blood culture, followed immediately by empiric antibiotic therapy.

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7. A 58-year-old man is admitted to the hospital for treatment of anemia. Two days ago, he had excessive blood loss following colon polyp removal via colonoscopy. Today, his hemoglobin concentration is 6.5 g/dL and hematocrit is 19.5%. Two months ago, in order to decrease transfusion errors, a blood lock system was implemented in which the patient ID must be entered into the lock to open the blood container; the container cannot be opened without the correct ID. Requiring staff to enter the patient's ID to open the blood lock is best described as which of the following?

A) An affordance
B) A forcing function
C) An interruption in care
D) Mapping of the design of the blood container
E) A policy leading to delays in care

Correct Answer: B.

A forcing function is a design feature that prevents a desired action from occurring if a prerequisite action is not performed first. Forcing functions reduce human error by anticipating mistakes that are likely to occur and requiring a verification step or other intermediary step to reduce the likelihood of such an error occurring. In this case, a common error in blood transfusion involves transfusion of the incorrect blood type or blood product, or administration of a product to the wrong patient. The blood container forcing function requires verification of patient identity before allowing the blood product to be removed. Forcing health care staff to perform this verification reduces the likelihood of transfusion error.

Incorrect Answers: A, C, D, and E.

An affordance (Choice A) is defined in human factors engineering as the functional potential of an individual or object within its environment. Within health care, this term is often applied to the design of a medical instrument to describe the way in which the instrument's design suggests or conveys how the instrument should be used.

An interruption in care (Choice C) and a policy leading to delays in care (Choice E) are incorrect. While forcing functions delay the immediate administration of care, they do so deliberately in order to reduce the likelihood of human error. Verification processes maximize patient safety and reflect a normal part of the administration of care, rather than an interruption or delay.

Mapping of the design of the blood container (Choice D) is incorrect. Process mapping is a method of describing the function of a process or device, in this instance a blood container, such that the steps of its use and the potential opportunities for error can be identified.

Educational Objective: A forcing function is a design feature that prevents a desired action from occurring if a prerequisite action is not performed first. Forcing functions reduce human error by anticipating mistakes that are likely to occur and requiring a verification step or other intermediary step to reduce the likelihood of such an error occurring.

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8. Twenty-four hours after admission to the hospital for treatment of temperatures to 38.5°C (101.3°F) and abdominal pain, a 22-year-old man has a decrease in his temperature. Two weeks ago, he went on a 5-day trip to South America and had diarrhea for 7 days. He has no previous history of serious illness. On admission, a CT scan of the abdomen showed a 5-cm mass in the right lobe of the liver; the mass was filled with fluid. He has received metronidazole, ampicillin, and gentamicin since admission. His current temperature is 37.4°C (99.3°F), and blood pressure is 120/75 mm Hg. The abdomen is flat with moderate right upper quadrant tenderness and guarding. There are no peritoneal signs. A serum titer for antibodies to *Entamoeba histolytica* is positive at 1:128. Which of the following is the most appropriate next step in management?

A) Continue the current antibiotic regimen for 10 days
B) Discontinue ampicillin and gentamicin and continue metronidazole
C) Perform examination of the stool for ova and parasites
D) Perform CT scan-guided aspiration of the mass
E) Perform surgical drainage of the mass

Correct Answer: B.

Infection with *Entamoeba histolytica* leads to amoebiasis, or amoebic dysentery. *E. histolytica* is an amoebic parasite that forms cysts, which can be transmitted through the fecal-oral route, typically through ingestion of contaminated water. Amoebic cysts mature to trophozoites in the large bowel, which may invade the colonic mucosa and interstitium, leading to symptoms of abdominal pain and bloody diarrhea, or may enter the bloodstream and cause hepatic amoebic abscesses, which present with fever and right upper quadrant pain. The diagnosis can be made by identifying cysts on stool microscopy or peripheral blood smear, which may show trophozoites with endosomes containing red blood cells, as well as by antibody assay or polymerase chain reaction. Colonoscopy shows mucosal ulcers that are often flask-shaped. Treatment of hepatic amoebic abscesses involves combination therapy with metronidazole or tinidazole as well as an antiluminal agent such as paromomycin or iodoquinol. In this otherwise stable patient with a confirmed diagnosis, it is most appropriate to discontinue broad-spectrum antibiotic treatment with ampicillin and gentamicin.

Incorrect Answers: A, C, D, and E.

Continuing the current antibiotic regimen for 10 days (Choice A) is unnecessary. In general, uncomplicated amoebic liver abscesses can be treated with amoebicidal agents alone.

Performing examination of the stool for ova and parasites (Choice C) is a useful method of diagnosing amoebiasis, but it is unnecessary for this patient in whom the diagnosis has already been confirmed with a serum antibody assay.

Performing CT scan-guided aspiration (Choice D) or surgical drainage (Choice E) of the mass is unnecessary given this patient's improvement with conservative management. Surgical drainage may be necessary for large abscesses greater than 5 cm in diameter, abscesses in the left lobe of the liver (which is associated with an increased risk for peritoneal rupture), or patients who fail to respond to antibiotic therapy.

Educational Objective: Infection with *Entamoeba histolytica* leads to amoebiasis, which can lead to bloody diarrhea and hepatic liver abscesses. Treatment of hepatic amoebic abscesses involves combination therapy with metronidazole or tinidazole as well as an antiluminal agent such as paromomycin or iodoquinol. Surgical drainage is often unnecessary.

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9. A previously healthy 23-year-old woman is brought to the emergency department 20 minutes after the sudden onset of shortness of breath, moderate abdominal pain, nausea, and an itchy rash over the abdomen. Her symptoms began after she ate a sugar cookie given to her by a friend. The patient had a peanut allergy as a child and before eating the cookie, she asked her friend to taste it. Neither she nor her friend tasted or smelled peanuts. The patient's only medication is an oral contraceptive. Her last menstrual period was 1 week ago. She has smoked one pack of cigarettes daily for 5 years. She drinks three 12-oz beers on weekends. She has been staying at different friends' homes during the past 2 months while searching for an apartment and has been using unfamiliar laundry detergents. She is in mild respiratory distress but is able to speak in full sentences. Her pulse is 110/min, respirations are 28/min, and blood pressure is 100/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. A photograph of the rash is shown. Scattered wheezes are heard bilaterally. Cardiac examination shows no abnormalities. Abdominal examination shows mild, diffuse tenderness to palpation; there is no rebound or guarding. Which of the following is the most appropriate initial pharmacotherapy?

A) Albuterol
B) Diphenhydramine
C) Epinephrine
D) Furosemide
E) Nitroglycerin
F) Prednisone

Correct Answer: C.

An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death caused by asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. This patient with a history of peanut allergy consumed a cookie that likely contained traces of peanuts, leading to an anaphylactic reaction with her symptoms of dyspnea, abdominal pain, nausea, urticaria, and wheezing. Therefore, the most appropriate initial treatment is epinephrine, as it treats the underlying mechanisms leading to the manifestations of anaphylaxis. Epinephrine causes vasoconstriction, bronchodilation, and decreased cytokine release. Delays to epinephrine administration increase the risk of death.

Incorrect Answers: A, B, D, E, and F.

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F) Prednisone

Correct Answer: C.

An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death caused by asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. This patient with a history of peanut allergy consumed a cookie that likely contained traces of peanuts, leading to an anaphylactic reaction with her symptoms of dyspnea, abdominal pain, nausea, urticaria, and wheezing. Therefore, the most appropriate initial treatment is epinephrine, as it treats the underlying mechanisms leading to the manifestations of anaphylaxis. Epinephrine causes vasoconstriction, bronchodilation, and decreased cytokine release. Delays to epinephrine administration increase the risk of death.

Incorrect Answers: A, B, D, E, and F.

Albuterol (Choice A) and diphenhydramine (Choice B) are used in the treatment of anaphylaxis, as are other antihistamines, such as famotidine, and glucocorticoids, such as methylprednisolone. However, the initial pharmacotherapy chosen for treating anaphylaxis should be epinephrine.

Furosemide (Choice D) is a loop diuretic most used in the management of congestive heart failure. An acute exacerbation of congestive heart failure can present with dyspnea, tachypnea, and hypoxia caused by pulmonary edema. However, this patient is young and has no cardiac medical history, making new congestive heart failure a less likely diagnosis than anaphylaxis.

Nitroglycerin (Choice E) can be used to treat the anginal chest pain that occurs with myocardial infarction, as it decreases preload to the heart by causing venodilation. This consequently leads to decreased myocardial demand and decreased chest pain. This patient has wheezing and urticaria, which are less likely to be seen with a myocardial infarction than with anaphylaxis. Additionally, the administration of nitroglycerin would likely lead to a decrease in this patient's already low blood pressure.

Prednisone (Choice F) may be useful in the treatment of allergic or autoimmune reactions. However, intravenous glucocorticoids, such as methylprednisolone, are more often chosen in the acute management of anaphylaxis given a more rapid onset of action and avoidance of aspiration risks with oral administration. Epinephrine is the most important pharmacotherapy in the treatment of anaphylaxis.

Educational Objective: Anaphylaxis is an IgE-mediated hypersensitivity reaction that leads to extensive degranulation of mast cells and basophils, which results in acute multisystem inflammation and vasodilation. Symptoms include bronchospasm with associated dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. Treatment includes epinephrine, antihistamines, bronchodilators, glucocorticoids, and fluids.

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10. A 67-year-old man comes to the physician because he has noticed blood in his urine for the past 2 weeks. He has no prior history of blood in his urine. He has not had pain or any other symptoms. He has hypertension controlled with a diuretic and hypercholesterolemia controlled with a lipid-lowering agent. His blood pressure is 120/76 mm Hg. Examination shows no abnormalities. Urinalysis shows RBCs that are too numerous to count. Which of the following is the most appropriate next step in diagnosis?

A) Renal scintigraphy
B) Retrograde urethrography
C) MRI of the pelvis
D) Cystoscopy
E) Renal biopsy

Correct Answer: D.

Bladder cancer is the most common malignant tumor of the urinary tract, a majority of which are transitional cell carcinoma. Risk factors include schistosomiasis, chronic cyclophosphamide use, aniline dye exposure, and tobacco smoking. Patients typically present with painless, gross hematuria. Diagnosis is confirmed with cystoscopy and biopsy, which is the most sensitive approach for the identification of small mucosal tumors. Transitional cell carcinoma in situ refers to a lesion of precursor malignant cells that are confined to the epithelial lining of the bladder and have not yet invaded the subepithelial connective tissue or muscle. Treatment requires resection of the cells with negative margins, which can be achieved through cystoscopic resection.

Incorrect Answers: A, B, C, and E.

Renal blood flow scan, also known as renal scintigraphy (Choice A), involves the use of an injected radiotracer to evaluate and quantify the flow of blood to the kidney.

Retrograde urethrography (Choice B) involves the injection of contrast into the urethra to evaluate for the extravasation of contrast, indicating urethral discontinuity in the setting of potential urethral trauma. Urethral injuries typically present after straddle injuries or secondary to pelvic fractures in trauma.

MRI of the pelvis (Choice C) can help evaluate the extent of metastatic disease but would not be the next step in diagnosis. Diagnosis of bladder cancer begins with cystoscopy.

Renal biopsy (Choice E) is used in the diagnosis of nephrotic and nephritic syndromes, as well as with interstitial nephritis or to evaluate the extent of renal involvement in systemic lupus erythematosus. While renal cell carcinoma also causes hematuria, it typically also presents with flank pain and weight loss. It is generally diagnosed with contrast-enhanced CT scan or MRI followed by biopsy.

Educational Objective: Bladder cancer typically presents with painless, gross hematuria. Diagnosis involves cystoscopy for direct visualization and identification of mucosal tumors.

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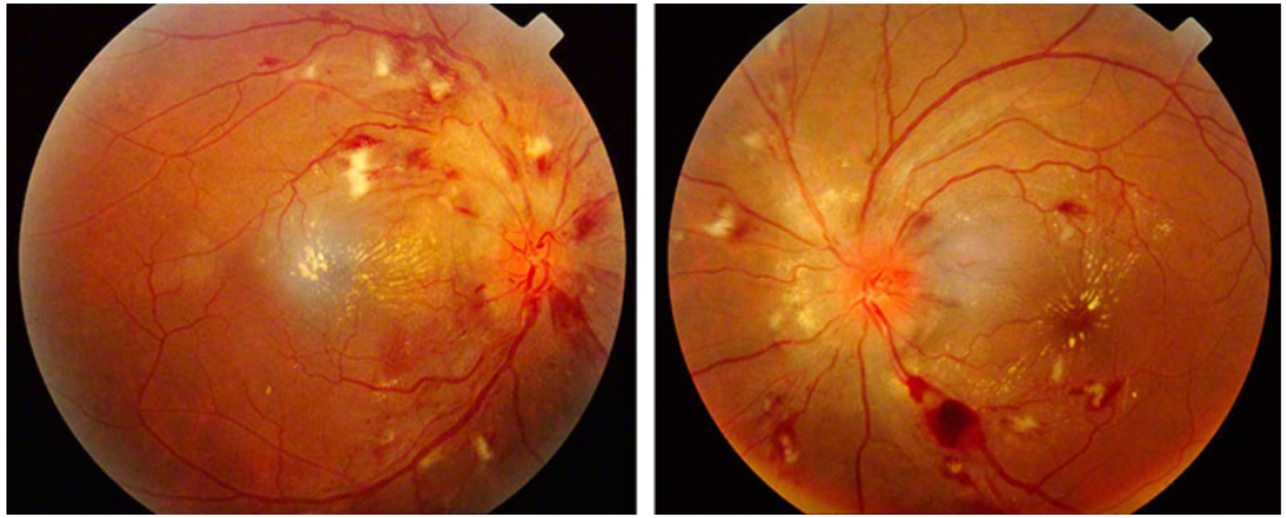

11. A 57-year-old man comes to the emergency department because of a 3-week history of headaches that have been increasing in severity and frequency. He also has a 2-week history of progressive blurred vision in both eyes. He has not had pain in the eyes. His last visit to a physician was 10 years ago because of pain in his fingers; at that visit, he was told he had high blood pressure. His temperature is 37°C (98.6°F), pulse is 90/min, respirations are 12/min, and blood pressure is 200/110 mm Hg. Repeat blood pressure measurements are 210/112 mm Hg and 214/114 mm Hg. Findings on funduscopic examination are shown. Examination shows ulnar deviation of both hands and several swollen interphalangeal joints. His fasting serum glucose concentration is 160 mg/dL. Which of the following is the most likely underlying cause of this patient's symptoms?

A) Diabetes mellitus
B) Glioblastoma multiforme
C) Hypertension
D) Idiopathic intracranial hypertension
E) Rheumatoid arthritis

Correct Answer: C.

Hypertensive retinopathy results from chronically increased blood pressure with subsequent microvasculopathy of the retinal arterial vasculature. Patients often report generalized blurry vision, although may be asymptomatic, and may also report associated symptoms such as headache or chest pain. Typical funduscopic findings include constricted retinal arterioles, retinal hemorrhage, nerve fiber layer infarctions, hard exudates, and lobular choroidal infarctions. The retinal hemorrhages typically occur in the inner retina and adopt a linear configuration, which allows them to be distinguished from the round hemorrhages that occur in the middle retinal layers in the setting of diabetic retinopathy. Retinal edema and hard exudates typically conform to the radial orientation of the nerve fibers with respect to the fovea, producing a characteristic macular star appearance. Optic disc edema may occur with disc hemorrhages and obscuration of the disc margin, mimicking papilledema. This patient's examination findings, including retinal hemorrhages, nerve fiber infarctions, hard exudates with macular star configuration, and bilateral optic disc edema, are characteristic of severe hypertensive retinopathy. Patients

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on funduscopic examination are shown. Examination shows ulnar deviation of both hands and several swollen interphalangeal joints. His fasting serum glucose concentration is 160 mg/dL. Which of the following is the most likely underlying cause of this patient's symptoms?

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B) Glioblastoma multiforme
C) Hypertension
D) Idiopathic intracranial hypertension
E) Rheumatoid arthritis

Correct Answer: C.

Hypertensive retinopathy results from chronically increased blood pressure with subsequent microvasculopathy of the retinal arterial vasculature. Patients often report generalized blurry vision, although may be asymptomatic, and may also report associated symptoms such as headache or chest pain. Typical funduscopic findings include constricted retinal arterioles, retinal hemorrhage, nerve fiber layer infarctions, hard exudates, and lobular choroidal infarctions. The retinal hemorrhages typically occur in the inner retina and adopt a linear configuration, which allows them to be distinguished from the round hemorrhages that occur in the middle retinal layers in the setting of diabetic retinopathy. Retinal edema and hard exudates typically conform to the radial orientation of the nerve fibers with respect to the fovea, producing a characteristic macular star appearance. Optic disc edema may occur with disc hemorrhages and obscuration of the disc margin, mimicking papilledema. This patient's examination findings, including retinal hemorrhages, nerve fiber infarctions, hard exudates with macular star configuration, and bilateral optic disc edema, are characteristic of severe hypertensive retinopathy. Patients with hypertensive crisis and evidence of end-organ damage should be managed emergently for appropriate blood pressure control.

Incorrect Answers: A, B, D, and E.

Diabetes mellitus (Choice A) causes diabetic retinopathy, which is characterized by round retinal hemorrhages, hard exudates, and retinal nerve fiber layer infarctions. The presence of linear retinal hemorrhages and bilateral optic disc edema is not consistent with diabetic retinopathy.

Glioblastoma multiforme (Choice B) is an aggressive primary brain astrocytoma that carries a poor prognosis. Patients present with seizures, headache, and focal neurologic deficits. While papilledema may be suggestive of increased intracranial pressure in the setting of a central nervous system lesion, this patient's linear retinal hemorrhages, hard exudates, and nerve fiber layer infarctions suggest that his optic disc edema is caused by hypertension, and therefore does not represent papilledema.

Idiopathic intracranial hypertension (IIH) (Choice D), or pseudotumor cerebri, may also present with papilledema. IIH refers to an idiopathic increase in intracranial pressure that typically occurs in women of childbearing age with obesity and presents with headaches that may be postural, visual deficits, nausea, and vomiting. Retinal findings, such as hemorrhages, hard exudates, and nerve fiber layer infarctions are not typical of IIH.

Rheumatoid arthritis (Choice E) commonly produces findings within the anterior segment of the eye such as dry eye, episcleritis, scleritis, or sterile corneal ulceration.

Educational Objective: Hypertensive retinopathy is characterized by constricted retinal arterioles, linear retinal hemorrhages, retinal nerve fiber layer infarctions, lobular choroidal infarctions, and retinal hard exudates. Optic disc edema may occur and can mimic papilledema. Patients with suspected hypertensive crisis should be managed emergently for appropriate blood pressure control.

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12. A case-control study is conducted to assess the effect of dietary fat intake on the occurrence of sudden cardiac death. One hundred fifty cases and controls are matched by age, sex assigned at birth, race, and history of hypertension, hypercholesterolemia, and cigarette smoking. Dietary intake history of the cases is obtained from the next of kin. Results show an odds ratio of 1.6 with a 95% confidence interval of 1.2 to 1.9. The authors conclude that there is a relationship between dietary fat intake and sudden cardiac death. Which of the following raises the most concern about the authors' conclusion?

A) Differential bias in assessing dietary fat
B) Inadequate sample size
C) Lack of blinding
D) Misclassification of cases and controls
E) Weak statistical association

Correct Answer: A.

Differential bias occurs when there is an unequal classification of exposure to a risk factor between groups with or without the outcome under study. In this scenario, the family members of patients who died of sudden cardiac death are more likely to recall dietary exposure to fatty foods, in comparison to the family members of patients whose next of kin has not died of sudden cardiac death. Differential bias differs from nondifferential bias, in which case there is an equal risk for exposure misclassification between groups with or without the outcome under study. Differential bias may lead to skewing of the odds ratio (OR) toward or away from the null, depending on the experimental design. In this scenario, a higher rate of misclassification of exposure to fatty foods in the group that experienced sudden cardiac death may lead to an erroneously high OR, skewing the results of the study.

Incorrect Answers: B, C, D, and E.

Inadequate sample size (Choice B) is incorrect. The appropriate sample size for a given experiment is dependent upon several factors, including the desired power, expected margin of error, confidence interval, and standard deviation.

Lack of blinding (Choice C) may occur in retrospective, case-control studies, but blinding may be accomplished by careful design of the questionnaire used to obtain information from subjects or next of kin, as in this scenario. We are unable to say whether precautions have been taken regarding blinding in this case. This scenario is more concerning for the risk for differential bias when recalling exposure status.

Misclassification of cases and controls (Choice D) may occur when subjects are inappropriately classified by outcome status. The outcome status under study in this scenario, sudden cardiac death, is relatively unambiguous and does not raise significant concern for misclassification.

Weak statistical association (Choice E) is a result of poor correlation between the outcome and exposure status. In this scenario, there is a strong statistical association between exposure to fatty foods and sudden cardiac death. However, the design of the experiment raises concern that this relationship may be affected by differential bias, leading to an erroneous result.

Educational Objective: Differential bias occurs when there is an unequal classification of exposure to a risk factor between groups with or without the outcome under study. In this scenario, the family members of patients who died of sudden cardiac death are more likely to recall dietary exposure to fatty foods, in comparison to the family members of patients whose next of kin has not died of sudden cardiac death. Differential bias may lead to skewing of the odds ratio toward or away from the null and may affect the results of the study.

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13. A 67-year-old woman comes to the physician because of a 2-month history of hoarseness. She has not had any other symptoms. She has no history of serious illness and takes no medications. She has smoked one pack of cigarettes daily for 45 years. Examination, including examination of the oropharynx, shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Follow-up examination in 6 weeks
B) X-rays of the maxillary sinuses
C) CT scan of the chest
D) Bronchodilator therapy
E) Indirect laryngoscopy

Correct Answer: E.

Laryngeal carcinoma may present with hoarseness, vocal changes, persistent cough, stridor, or dysphagia, and is more common in patients with a history of smoking. The vast majority of laryngeal carcinomas are squamous, and location in the glottic or supraglottic region is frequent. Supraglottic lesions are likely to induce dysphagia, whereas hoarseness is an early symptom of glottic lesions as a result of involvement of the vocal cords. The diagnosis is established by direct tumor visualization, which may be accomplished by indirect laryngoscopy. Thorough examination of the neck is also essential to determine the extent of the tumor and to identify associated lymphadenopathy, which may indicate nodal metastasis. Distant metastases may also occur. CT scan or PET scan may be useful for characterizing metastatic disease. Early stage laryngeal carcinoma is associated with a high survival rate, although locally extensive or metastatic disease is more difficult to treat. Treatment involves surgical excision, radiation therapy, and/or chemotherapy.

Incorrect Answers: A, B, C, and D.

Follow-up examination in 6 weeks (Choice A) is incorrect. Early diagnosis and treatment of laryngeal carcinoma is associated with superior outcomes and a higher rate of survival.

X-rays of the maxillary sinuses (Choice B) are useful for the identification of sinusitis, which typically presents with headache, facial pain, postnasal drip, or halitosis.

CT scan of the chest (Choice C) is an important component of the staging of laryngeal carcinoma and other cancers of the head and neck. Identification of the primary tumor through direct visualization is the first step in diagnosis and should be performed before a CT scan.

Bronchodilator therapy (Choice D) is useful for the treatment of asthma and chronic obstructive pulmonary disease, which may occur in smokers. These diseases are characterized by airway disease with subsequent wheezing. Hoarseness would be atypical and is indicative of laryngeal pathology.

Educational Objective: Laryngeal carcinoma is common in patients with a history of smoking and may present with hoarseness, vocal changes, persistent cough, stridor, or dysphagia. The diagnosis is established by direct tumor visualization, which may be accomplished by indirect laryngoscopy.

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14. A 57-year-old man is admitted to the hospital because of fever, shortness of breath, and cough productive of yellow sputum. He has prostate cancer metastatic to the bone; his only symptom from the cancer is occasional back pain well controlled with oral acetaminophen and hydrocodone. At his last appointment 6 months ago, his serum prostate-specific antigen assay was stable, and his disease had not progressed. He plays golf several times each week and enjoys traveling with his wife. His advance directive states that he does not want intubation or mechanical ventilation unless he has an acute illness with a reasonable chance of recovery to a good quality of life. He is lethargic and unable to communicate. His temperature is 38.9°C (102°F), pulse is 100/min, respirations are 30/min, and blood pressure is 148/92 mm Hg. Pulmonary examination shows shallow, rapid breathing. He is using accessory muscles of respiration. Inspiratory crackles are heard at the right upper and lower lung fields. Arterial blood gas analysis on 100% oxygen shows:

pH	7.36
Pco_2	45 mm Hg
Po_2	42 mm Hg

An x-ray of the chest shows diffuse right-sided infiltrates. Which of the following is the most appropriate next step in management?

A) Consult the hospital ethics committee

B) Begin noninvasive positive pressure ventilation by face mask

C) Continue oxygen by face mask and administer intravenous morphine for comfort

D) Intubate and begin mechanical ventilation

Correct Answer: D.

Regardless of advance directives or prior code status documentation, physicians need to assess all patients' code status during each hospitalization, as the context of each hospitalization differs. The patient or the patient's decision maker (eg, legal guardian or durable power of attorney) should be given the opportunity to update the patient's code status during each hospitalization. This patient is unable to communicate, and his acute hypoxia necessitates an urgent decision by the physician as it represents an emergent and immediate life threat that is potentially reversible. Based on his advance directive and current clinical condition, intubation and mechanical ventilation is appropriate given his reasonable chance of recovery with appropriate treatment.

Incorrect Answers: A, B, and C.

Consulting the hospital ethics committee (Choice A) is unnecessary since the patient has a clear advance directive outlining his wishes. This would also delay appropriate emergency care that is required to sustain the patient's life.

Beginning noninvasive positive pressure ventilation by face mask (Choice B) and continuing oxygen by face mask and administering intravenous morphine for comfort (Choice C) are both inappropriate and represent a misinterpretation of the patient's advance directive. This patient with lobar pneumonia has a good chance of recovery with treatment and should be immediately intubated. Noninvasive positive pressure ventilation is a reasonable option for patients who are not at risk for airway compromise prior to intubation; however, that is not the case with this patient. His mental status, hypoxic respiratory failure, and increased work of breathing together indicate that invasive mechanical ventilation is most appropriate.

Educational Objective: Physicians should assess a patient's code status during each hospitalization. The patient or the patient's decision maker (eg, legal guardian or durable power of attorney) should be given the opportunity to update the patient's code status during each hospitalization.

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15. A 77-year-old man comes to the physician because of a 3-day history of passing air and fecal material during urination. He has a long-standing history of intermittent constipation. His last examination was 20 years ago. He has smoked two packs of cigarettes daily for 55 years. He is 183 cm (6 ft) tall and weighs 70 kg (155 lb); BMI is 21 kg/m^2. Vital signs are within normal limits. Abdominal examination shows mild distention. Bowel sounds are decreased. Rectal examination shows a diffusely enlarged prostate. There is no stool in the rectal vault. Laboratory studies show:

Hemoglobin	14 g/dL
Leukocyte count	9600/mm^3
Platelet count	444,000/mm^3
Urine	
WBC	>100/hpf
Flora	mixed

Which of the following is the most likely cause of this patient's symptoms?

A) Appendiceal abscess
B) Diverticular disease
C) Inflammatory bowel disease
D) Prostate cancer
E) Transitional cell carcinoma of the bladder

Correct Answer: B.

The layers of the gastrointestinal wall, from the luminal surface to the exterior of the bowel, include the mucosa, submucosa, muscularis propria, and serosa. Diverticulosis, also known as diverticular disease, is characterized by sac-like protrusions of the colonic wall that are hypothesized to develop secondary to increased intraluminal pressure. This predisposes the herniation of mucosa and submucosa through the muscularis propria of the colonic wall. Risk factors for the development of diverticulosis include abnormal colonic motility, constipation, high dietary intake of red meat and low dietary fiber, physical inactivity, and obesity. Complications of diverticular disease include lower gastrointestinal bleeding and diverticulitis. Rarely, diverticular disease can lead to the development of a colovesical fistula in which there is a connection between the rectum and the urinary bladder. This can lead to pneumaturia and passage of fecal material during urination, as well as the development of urinary tract infections, seen in this patient with mixed flora and numerous leukocytes on urinalysis. Diagnosis involves contrast CT imaging or direct visualization. Treatment involves antibiotics and surgical repair.

Incorrect Answers: A, C, D, and E.

Appendiceal abscess (Choice A) can be a complication of untreated appendicitis. Appendicitis and appendiceal abscess would present with right lower quadrant abdominal pain and tenderness, and generally fever, nausea, vomiting. It would not cause pneumaturia or passage of fecal material during urination.

Inflammatory bowel disease (Choice C) comprises both Crohn disease and ulcerative colitis. Symptoms include chronic abdominal pain, weight loss, bloody diarrhea, abdominal bloating, and tenesmus. While colovesical fistulas can be a complication of inflammatory bowel disease, most patients diagnosed with inflammatory bowel disease are younger than age 30 years. This patient does not have a history of abdominal pain or bloody diarrhea, both of which would be expected in the setting of inflammatory bowel disease.

Prostate cancer (Choice D) or hyperplasia can lead to urethral obstruction when outflow from bilateral kidneys is obstructed by an underlying pathology. It can lead to postrenal azotemia and difficulty

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Flora Mixed

Which of the following is the most likely cause of this patient's symptoms?

A) Appendiceal abscess
B) Diverticular disease
C) Inflammatory bowel disease
D) Prostate cancer
E) Transitional cell carcinoma of the bladder

Correct Answer: B.

The layers of the gastrointestinal wall, from the luminal surface to the exterior of the bowel, include the mucosa, submucosa, muscularis propria, and serosa. Diverticulosis, also known as diverticular disease, is characterized by sac-like protrusions of the colonic wall that are hypothesized to develop secondary to increased intraluminal pressure. This predisposes the herniation of mucosa and submucosa through the muscularis propria of the colonic wall. Risk factors for the development of diverticulosis include abnormal colonic motility, constipation, high dietary intake of red meat and low dietary fiber, physical inactivity, and obesity. Complications of diverticular disease include lower gastrointestinal bleeding and diverticulitis. Rarely, diverticular disease can lead to the development of a colovesical fistula in which there is a connection between the rectum and the urinary bladder. This can lead to pneumaturia and passage of fecal material during urination, as well as the development of urinary tract infections, seen in this patient with mixed flora and numerous leukocytes on urinalysis. Diagnosis involves contrast CT imaging or direct visualization. Treatment involves antibiotics and surgical repair.

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Prostate cancer (Choice D) or hyperplasia can lead to urethral obstruction when outflow from bilateral kidneys is obstructed by an underlying pathology. It can lead to postrenal azotemia and difficulty urinating but would not cause pneumaturia or urination of fecal material without concomitant fistula. This patient's prostate examination is consistent with benign prostatic hyperplasia, not malignancy.

Transitional cell carcinoma of the bladder (Choice E), also known as urothelial carcinoma, typically presents in patients, especially men, who smoke cigarettes. It can present with hematuria and urinary tract obstruction. It is not as likely as diverticular disease to cause fistulation, especially in early or "silent" disease.

Educational Objective: Diverticular disease can lead to the development of a colovesical fistula in which there is an abnormal connection between the rectum and the urinary bladder This can lead to complications of urine leakage through the rectum and associated urinary tract infections with pneumaturia.

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16. A 25-year-old man comes to the physician 2 hours after the sudden onset of sharp right buttock pain that radiates to the back of his knee. The pain worsens when he sits for a prolonged period or drives. He is able to walk. Use of over-the-counter ibuprofen has provided mild relief. He has no history of serious illness and takes no other medications. On examination, ipsilateral and contralateral straight-leg raise testing is positive. Muscle strength is normal throughout. Sensation is intact throughout. Which of the following is the most appropriate next step in diagnosis?

A) Electromyography and nerve conduction studies
B) MRI of the lumbosacral spine
C) Myelography
D) X-ray of the lumbosacral spine
E) No further testing is indicated

Correct Answer: E.

Lumbar disc herniation and piriformis syndrome are both common causes of sciatica. Disc herniation occurs most often following chronic disc degeneration combined with a minor traumatic event such as bending and lifting a heavy object causing an acute increase in the intradiscal pressure. Disc herniation typically presents as acute back pain along with symptoms of lumbosacral radiculopathy, including acute extremity pain and/or weakness in a dermatomal and myotomic distribution with respect to the impinged spinal nerve. Piriformis syndrome presents similarly but with pain reproduced with palpation of the piriformis on the affected side. Regardless of cause, sciatica is diagnosed clinically, through a combination of history and examination maneuvers, including straight-leg raise testing, in which flexion of the hip while the leg is held in extension at the knee reproduces pain in the lower back that generally shoots down the leg. Lumbar imaging with MRI or CT scan is useful for patients with severe motor or sensory dysfunction but is not required for most patients with mild or moderate symptoms without an objective neurologic deficit and in whom there is no concern for spinal cord impingement. Trial of therapy is generally appropriate before imaging in such cases. Patients with evidence of muscular weakness may benefit from nerve conduction studies or electromyography. Most patients with sciatica demonstrate spontaneous improvement with conservative management, including analgesia, physical therapy, and activity as tolerated. Prolonged bed rest is not necessary for most patients and may worsen pain and prolong recovery.

Incorrect Answers: A, B, C, and D.

Electromyography and nerve conduction studies (Choice A) are used to differentiate myopathic and neuropathic causes of extremity weakness and would not be used in this patient with normal muscle strength and sensation.

MRI of the lumbosacral spine (Choice B) is indicated for evaluation of acute onset neurologic deterioration from cauda equina syndrome. Cauda equina syndrome occurs from acute compression of the cauda equina nerve roots in the lumbosacral spinal canal, most commonly from an acute disc herniation, or a traumatic or pathologic vertebral column fracture. This results in bilateral lower extremity weakness, loss of deep tendon reflexes, bowel or bladder dysfunction (eg, overflow urinary incontinence), and saddle anesthesia. This patient does not have any signs of cauda equina syndrome, so MRI is not indicated at this time.

Myelography (Choice C) involves examination of the spinal cord using x-ray or CT scan following injection of an intrathecal contrast medium. It has largely been replaced by MRI because of improved image accuracy, absence of radiation, and noninvasive technique.

X-ray of the lumbosacral spine (Choice D) may be useful for the diagnosis of vertebral compression fractures, which commonly occur in elderly patients with low bone mineral density, especially among postmenopausal females. This patient's age, history, and radiation of pain are more suggestive of disc herniation or piriformis syndrome.

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Educational Objective: Sciatica is often caused by lumbar disc herniation. It typically presents with acute back pain along with symptoms of lumbosacral radiculopathy, including acute extremity pain and/or weakness in a dermatomal and myotomic distribution with respect to the impinged nerve, generally radiating down the back of the leg. It is typically a self-limited process, with most patients demonstrating spontaneous improvement with conservative management.

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17. A 16-year-old girl is brought to the physician by her mother because of an 8-month history of irregular menstrual periods, acne, and facial hair. Menarche was at the age of 12 years. Menses occur at irregular 35- to 42-day intervals; they last 1 week, and the flow is heavy. Moderate cramps on the first 2 days are relieved with ibuprofen therapy. The patient had recurrent urinary tract infections until the age of 10 years. She has no other history of serious illness and takes no other medications. She is 163 cm (5 ft 4 in) tall and weighs 77 kg (170 lb); BMI is 29 kg/m^2. Her temperature is 36.9°C (98.4°F), pulse is 78/min, respirations are 20/min, and blood pressure is 128/84 mm Hg. Examination shows scattered papules, pustules, and comedones over the face. There is sparse, coarse hair over the chin. The neck is supple; there is no thyromegaly. Breast examination shows no masses. Breast and pubic hair development are sexual maturity rating (SMR) stage 5. Serum studies are most likely to show an increased concentration of which of the following?

A) Follicle-stimulating hormone
B) 11α-Hydroxyprogesterone
C) 21α-Hydroxyprogesterone
D) Luteinizing hormone
E) Thyroid-stimulating hormone

Correct Answer: D.

Polycystic ovarian syndrome (PCOS) presents with irregular menses, menorrhagia, infertility, acne, and hirsutism, often in patients with an increased body weight. It requires two of the following for diagnosis: oligo/anovulation, polycystic ovaries on ultrasonography, and clinical or biochemical signs of hyperandrogenism. It is also associated with signs of insulin resistance, such as acanthosis nigricans and increased blood glucose concentrations. PCOS is caused by an abnormal hypothalamic hormonal feedback response, which leads to increased luteinizing hormone in comparison to follicle-stimulating hormone, as well as markedly increased androgen (eg, testosterone) production from the theca lutein cells. Treatment includes weight loss, combined oral contraceptives for menstrual regulation, and spironolactone or ketoconazole for hirsutism.

Incorrect Answers: A, B, C, and E.

Follicle-stimulating hormone (Choice A) may be increased in menopause or in central precocious puberty. Its role in the hypothalamic-pituitary-gonadal axis in females is to stimulate the production of follicles in the ovary to support an egg for development. It is not increased to the same degree as luteinizing hormone in PCOS.

Both 11α-hydroxyprogesterone (Choice B) and 21α-hydroxyprogesterone (Choice C) are precursors to aldosterone and thus carry a degree of mineralocorticoid activity. Increased mineralocorticoid activity would be expected to produce hypertension, and/or hypokalemia or metabolic alkalosis depending on hormonal activity of the precursor. It would not explain this patient's ovulatory dysfunction or hyperandrogenism.

Thyroid-stimulating hormone (Choice E) can be used to diagnose both hypothyroidism and hyperthyroidism. It is increased in primary hypothyroidism. Hypothyroidism is associated with fatigue, weight gain, ovulatory dysfunction, constipation, and weight gain. While hypothyroidism could explain this patient's irregular menses with menorrhagia, as well as her increased body weight, hypothyroidism does not cause hyperandrogenism.

Educational Objective: Polycystic ovarian syndrome presents with menstrual irregularities, signs of androgen excess, obesity, insulin resistance, and polycystic ovaries on ultrasonography. It is caused by an abnormal hypothalamic hormonal feedback response, which leads to increased luteinizing hormone and increased androgen production. Treatment includes weight loss, combined oral contraceptives for menstrual regulation, and spironolactone or ketoconazole for hirsutism.

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18. A 49-year-old woman comes to the physician for preoperative examination before she undergoes cholecystectomy. During the past 3 years, she has had recurrent cholecystitis and multiple gallstones. She has not had shortness of breath, difficulty swallowing, or hoarseness. She has rheumatoid arthritis with morning stiffness and widespread joint swelling. Her medications are methotrexate, folic acid, and prednisone. Vital signs are within normal limits. Examination shows nodules over the extensor aspect of the upper extremities. There is swelling of the wrists, metacarpophalangeal joints of the hands, and knees; there are swan neck deformities of the fingers. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management to decrease this patient's risk for operative complications?

A) Discontinuation of methotrexate
B) Discontinuation of prednisone
C) Indirect laryngoscopy
D) Pulmonary function testing
E) X-rays of the cervical spine

Correct Answer: E.

Rheumatoid arthritis (RA) is an autoimmune disorder characterized by systemic inflammation that prominently affects synovial joints. It is chronic and progressive, often leading to significant morbidity. Symptoms include the gradual onset of symmetric arthralgia and joint swelling, as well as morning stiffness, commonly in the fingers and wrists. Chronic disease can progress to affect proximal joints and the cervical spine and leads to significant joint damage and deformities. Severe disease can cause systemic disease, such as interstitial lung disease, vasculitis, pleuritis, pericarditis, anemia, and subcutaneous nodules. Atlantoaxial involvement is common in chronic disease and may be associated with subluxation with consequent spinal cord injury or radiculopathy. Evaluation of the cervical spine with flexion and extension x-rays in patients with chronic RA is appropriate prior to general anesthesia, to evaluate for atlantoaxial instability and inform the technique for intubation. Direct laryngoscopy, often used to intubate patients for general anesthesia, involves significant neck extension and flexion, which could lead to catastrophic neurologic damage in the setting of atlantoaxial instability. With significant instability, intubation with in-line stabilization is needed. Therefore, the most appropriate next step in management in this case is x-rays of the cervical spine to evaluate risk for direct laryngoscopy.

Incorrect Answers: A, B, C, and D.

Discontinuation of methotrexate (Choice A) is not necessary. Methotrexate is used in the treatment of RA because of its anti-inflammatory and immunosuppressive actions. While it can cause hepatotoxicity, pulmonary disease, renal injury, and increased risk for infection, its importance in managing this patient's RA outweighs its risk.

Discontinuation of prednisone (Choice B) is not necessary. It acts as an anti-inflammatory and immunosuppressive agent in the treatment of RA. Discontinuation of chronic prednisone therapy can cause adverse effects, as long-standing prednisone therapy can cause adrenal insufficiency if discontinued. Thus, chronic prednisone therapy may necessitate stress-dose steroids prior to this patient's procedure, and discontinuation of prednisone may be harmful.

Indirect laryngoscopy (Choice C) may benefit this patient. However, this patient should not proceed to general anesthesia without evaluation of cervical spine stability, as indirect laryngoscopy can also require neck extension, leading to neurologic damage in the setting of severe instability.

Pulmonary function testing (Choice D) is not indicated. While RA can cause interstitial lung disease when chronic and severe, this patient has no elements in the history or physical examination that raise the concern for lung disease. With no symptoms, evaluation of this patient's lung function with pulmonary function testing is unlikely to change anesthetic management or decrease risk for perioperative

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Educational Objective: Rheumatoid arthritis (RA) is a chronic, progressive, autoimmune disease that primarily leads to destruction of synovial joints. Atlantoaxial involvement is common in severe disease and can lead to atlantoaxial instability with consequent spinal cord injury and radiculopathy. Therefore, patients with chronic RA should be evaluated with cervical spine x-rays prior to undergoing intubation, as direct laryngoscopy often utilizes neck extension that could lead to catastrophic neurologic damage in the setting of severe instability.

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19. A 32-year-old woman, gravida 1, para 1, comes to the physician because of spontaneous discharge from her nipples during the past 3 months. She discontinued breast-feeding her child 1 year ago. She takes no medications. Menses occur at regular 28-day intervals. On physical examination, a milky white discharge can be expressed from both nipples. Examination shows no other abnormalities. Her fasting serum prolactin concentration is 40 ng/mL. The most appropriate next step in diagnosis is measurement of which of the following serum concentrations?

A) Cortisol
B) Dopamine
C) Estrogen
D) Gonadotropin-releasing hormone
E) Thyroid-stimulating hormone

Correct Answer: E.

An abnormal increase in serum prolactin is defined as hyperprolactinemia and causes nonphysiologic discharge of milk from the nipple (galactorrhea) and growth of glandular breast tissue. A diagnosis of hyperprolactinemia is made when the serum prolactin concentration is greater than 30 ng/mL in premenopausal women or greater than 20 ng/mL in men and postmenopausal women. After cessation of breast-feeding, serum prolactin concentrations typically return to prepregnancy levels. Common causes of hyperprolactinemia include hyperfunctioning anterior pituitary microadenomas, hypothyroidism, and dopamine-blocking medications, as prolactin is negatively regulated by dopamine. Prolactin is positively regulated by the TSH-releasing hormone (TRH) and, in states of hypothyroidism with upregulated TRH, galactorrhea can also occur. The initial workup should involve measurement of TSH concentration and evaluation of any dopamine-blocking medications the patient may be taking. If these steps are unremarkable, further diagnostic evaluation should include MRI of the brain to assess for the presence of a pituitary adenoma. Treatment of hypothyroidism, if present, will resolve hyperprolactinemia and the patient's symptoms.

Incorrect Answers: A, B, C, and D.

Cortisol (Choice A) measurement is useful in the workup of hyperaldosteronism and adrenal insufficiency, though the serum concentration fluctuates widely throughout the day. It is also used to evaluate for corticotropin deficiency to test for panhypopituitarism, which results in prolactin deficiency and an inability to lactate after delivery.

Dopamine (Choice B) is the primary regulator of prolactin secretion from the anterior pituitary gland, but serum concentrations do not correspond to the level of regulatory activity. Assessment for hypothyroidism and dopamine-blocking medications is more useful.

Estrogen (Choice C) and gonadotropin-releasing hormone (Choice D) are generally not useful in the evaluation of galactorrhea. The evaluation for pituitary abnormalities, especially if there is concern for hypersecretion, includes checking insulin-like growth factor 1, corticotropin, follicle-stimulating hormone, and luteinizing hormone.

Educational Objective: Hyperprolactinemia is defined as a serum prolactin concentration greater than 30 ng/mL in premenopausal women or greater than 20 ng/mL in men and postmenopausal women. Galactorrhea is a common presenting symptom. Initial workup should rule out hypothyroidism and renal insufficiency as causes of an increased serum prolactin concentration, and MRI of the pituitary gland should be obtained.

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20. A 57-year-old man comes to the physician for a follow-up examination. One year ago, he sustained a myocardial infarction. He has coronary artery disease, hypertension, and type 2 diabetes mellitus. His medications are atorvastatin, lisinopril, metformin, metoprolol, and aspirin. He has smoked one-half pack of cigarettes daily for 25 years. He is 178 cm (5 ft 10 in) tall and weighs 97 kg (213 lb); BMI is 31 kg/m^2. He feels well. His pulse is 62/min, and blood pressure is 145/78 mm Hg. Examination shows no other abnormalities. Laboratory studies show a hemoglobin A_{1c} of 6.5% and serum LDL-cholesterol concentration of 110 mg/dL. Serum electrolyte, urea nitrogen, glucose, and creatinine concentrations are within the reference ranges. The physician recommends smoking cessation. Addition of which of the following is the most appropriate next step in pharmacotherapy?

A) Clonidine
B) Exenatide
C) Hydrochlorothiazide
D) Rosiglitazone
E) Sitagliptin
F) Spironolactone

Correct Answer: C.

Patients with a history of acute coronary syndrome are at increased risk for future adverse cardiovascular events. Management focuses on control of modifiable risk factors to reduce this risk. Patients should be counseled on smoking cessation, healthy diet, and regular exercise. Common comorbid conditions that contribute to increased risk include hypertension, diabetes mellitus, metabolic syndrome, and hyperlipidemia. The American Heart Association recommends a blood pressure goal of less than 140/90 mm Hg for adults, unless the patient also has diabetes mellitus or chronic renal disease, in which case the goal is less than 130/80 mm Hg. This patient has a blood pressure above goal and addition of a second antihypertensive agent, such as hydrochlorothiazide, is likely to provide the most benefit at this time.

Incorrect Answers: A, B, D, E, and F.

Clonidine (Choice A) is an alpha-adrenergic agonist primarily used to treat attention deficit hyperactivity disorder in children and to manage tics in Tourette disorder. It is also an antihypertensive that is typically reserved for use in certain clinical situations, as other antihypertensives such as thiazide diuretics have a lower risk for adverse effects.

Exenatide (Choice B) and sitagliptin (Choice E) are second-line antihyperglycemic agents in the glucagon-like peptide 1 (GLP-1) receptor agonist and dipeptidyl peptidase 4 (DPP-4) inhibitor classes respectively. Both are reasonable choices to add for patients who are not meeting glycemic goals with metformin monotherapy and lifestyle changes. A hemoglobin A_{1c} of 6.5% is an acceptable concentration for a patient with known cardiovascular disease, as tighter glycemic control has a higher risk for adverse effects from hypoglycemia with no additional benefit.

Rosiglitazone (Choice D) is a second-line antihyperglycemic agent in the thiazolidinedione class. It is not recommended for use because of concerns about increased risk for major adverse cardiovascular events.

Spironolactone (Choice F) is an aldosterone receptor antagonist used as a potassium-sparing diuretic, most commonly in patients receiving loop diuretics. It is not indicated at this time.

Educational Objective: Secondary prevention for cardiovascular disease focuses on modifiable risk factors, especially appropriate management of comorbidities such as hypertension. A blood pressure goal of less than 140/90 mm Hg for adults is recommended, unless the patient also has diabetes mellitus or chronic renal disease, in which case the goal is less than 130/80 mm Hg.

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21. A 60-year-old woman with osteoarthritis of the right knee comes to the office to discuss treatment options, including total knee replacement. Medications are naproxen and 81-mg aspirin. Vital signs are within normal limits. Examination shows edema of the right knee; range of motion of the right knee is decreased. Results of laboratory studies are within the reference ranges. The patient asks the physician about the success and complication rates associated with total knee replacement at the local university hospital. Which of the following types of studies is most appropriate for the physician to reference to answer this patient's question?

A) Case-control study
B) Cross-sectional study
C) Institutional case series
D) Randomized controlled trial

Correct Answer: C.

A case series study is a descriptive study that describes the history, possible exposures, clinical findings, and treatment results of a group of patients with a similar diagnosis. Case series studies are nonanalytic and do not imply a cause-and-effect relationship. They do not test a hypothesis nor are they randomized. They are useful in characterizing the natural history of a disease or response to treatment and are also useful for evaluating the outcomes of a particular procedure or patient population at a single institution. They are useful in describing rare diseases, as the small population size may not permit conduction of a larger cohort, or randomized trials with sufficient power.

Incorrect Answers: A, B, and D.

Case-control studies (Choice A) group patients according to disease or procedure outcome status and analyze the odds of exposure to a particular hazard. The appropriate statistical measure of case-control studies is the odds ratio (OR).

Cross-sectional studies (Choice B) examine a sample population at a single point in time and describe the prevalence of a particular disease or risk factor. In contrast to cohort studies, which group patients according to exposure status, and case-control studies, which group patients according to disease outcome status, cross-sectional studies analyze both disease states and exposures simultaneously.

Randomized controlled trials (Choice D) are a type of prospective, interventional study design wherein patients are randomly assigned to receive a particular intervention. The intervention may be compared against placebo therapy or standard therapy, depending on the study design and the disease being studied. When combined with blinding procedures, randomized control studies form the gold standard of medical research and generate more powerful evidence than other forms of observational or descriptive studies.

Educational Objective: A case series study is a descriptive study that describes the history, possible exposures, clinical findings, and treatment results of a group of patients with a similar diagnosis. Case series studies are useful for studying the outcomes or natural history of a particular group, procedure, or treatment.

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22. A 72-year-old woman comes to the office with her son because of a "strange mole" on her back that she first noticed 6 months ago. The patient's son says he thinks it has enlarged during the past month. The patient says the mole is mildly itchy but not painful, and she has not had bleeding from the area. She has not had any weight loss or changes in appetite. Medical history is unremarkable, and she takes no medications. The patient has spent a lot of time outside by her son's new swimming pool during the past summer months. Vital signs are within normal limits. A photograph of the lesion is shown. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate diagnostic study at this time?

A) Culture of the lesion
B) Full-thickness biopsy of the lesion
C) KOH testing of a scraping of the lesion
D) Shave biopsy of the lesion
E) No diagnostic study is indicated

Correct Answer: E.

Seborrheic keratosis is a benign proliferation of the epidermis. It is characterized histologically by a benign, acanthotic proliferation of keratinocytes with absence of cellular atypia. The lesions are typically round, raised, brown or tan in color, and sharply demarcated with an adherent or stuck-on appearance. Seborrheic keratosis is common in middle-aged and older adults, and it is associated with increasing age. While seborrheic keratosis is benign, the sudden appearance of numerous seborrheic keratosis lesions on the back and trunk, known as the Leser-Trélat sign, can be a paraneoplastic manifestation of gastrointestinal malignancy. The diagnosis of seborrheic keratosis is established based on clinical appearance, and no diagnostic study is indicated. Treatment is not necessary, although lesions that are cosmetically bothersome may be removed with cryotherapy or simple excision.

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E) No diagnostic study is indicated

Correct Answer: E.

Seborrheic keratosis is a benign proliferation of the epidermis. It is characterized histologically by a benign, acanthotic proliferation of keratinocytes with absence of cellular atypia. The lesions are typically round, raised, brown or tan in color, and sharply demarcated with an adherent or stuck-on appearance. Seborrheic keratosis is common in middle-aged and older adults, and it is associated with increasing age. While seborrheic keratosis is benign, the sudden appearance of numerous seborrheic keratosis lesions on the back and trunk, known as the Leser-Trélat sign, can be a paraneoplastic manifestation of gastrointestinal malignancy. The diagnosis of seborrheic keratosis is established based on clinical appearance, and no diagnostic study is indicated. Treatment is not necessary, although lesions that are cosmetically bothersome may be removed with cryotherapy or simple excision.

Incorrect Answers: A, B, C, and D.

Culture of the lesion (Choice A) is not necessary. Seborrheic keratosis is a result of proliferation of keratinocytes and is not infectious in cause.

Full-thickness biopsy of the lesion (Choice B) and shave biopsy of the lesion (Choice D) are methods of obtaining tissue for histopathologic analysis during the diagnosis of benign or malignant cutaneous neoplasms. Shave biopsy may be adequate for initial diagnosis of certain malignancies, such as basal cell carcinoma. Other techniques, such as punch biopsy or excisional biopsy, are more appropriate when determination of Breslow thickness is necessary. Biopsy of seborrheic keratosis is not usually necessary.

KOH testing of a scraping of the lesion (Choice C) is useful for identification of fungal elements in the setting of tinea corporis or versicolor. Seborrheic keratosis does not have an underlying fungal cause.

Educational Objective: Seborrheic keratosis is a benign proliferation of the epidermal keratinocytes. Lesions are typically round, raised, brown or tan in color, and sharply demarcated with an adherent or stuck-on appearance. The main risk factor for seborrheic keratosis is increasing age. The diagnosis is established based on clinical appearance, and no diagnostic study is indicated.

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23. A 27-year-old woman is brought to the emergency department because of a 2-day history of fever, pain with urination, and progressive generalized weakness. She has systemic lupus erythematosus complicated by nephritis. Current medications include prednisone and cyclophosphamide. Her temperature is 39.4°C (103°F), pulse is 122/min, respirations are 24/min, and blood pressure is 88/62 mm Hg. Examination shows warm, flushed skin. There is moderate suprapubic and right flank tenderness. Her leukocyte count is 18,000/mm^3 (80% segmented neutrophils, 5% bands, 1% eosinophils, 1% basophils, 10% lymphocytes, and 3% monocytes). Urinalysis shows 100 WBC/hpf. A Gram stain shows numerous gram-negative rods. Intravenous administration of piperacillin and tazobactam and 2 liters of 0.9% saline is started. Thirty minutes later, her pulse is 124/min, and blood pressure is 92/68 mm Hg. Which of the following is the most appropriate next step in management?

A) Administration of ciprofloxacin
B) Administration of gentamicin
C) Administration of hydrocortisone
D) Administration of metoprolol
E) Cardioversion

Correct Answer: C.

This patient's hypotension and tachycardia have failed to improve with appropriate initiation of intravenous antibiotics and fluid resuscitation. She may benefit from the addition of a vasopressor; however, her history of chronic corticosteroid use for systemic lupus erythematosus should prompt the physician to consider acute adrenal insufficiency and adrenal crisis precipitated by severe infection. Adrenal crisis is a life-threatening emergency, and prompt administration of hydrocortisone is the most appropriate next step in management. In secondary adrenal insufficiency, as with chronic exogenous steroid use, an acute stressor suddenly increases physiologic demand for cortisol, and the adrenal glands are unable to meet the demand. This results in inadequate vascular tone to maintain blood pressure. Survival dramatically increases with early recognition and management of adrenal crisis.

Incorrect Answers: A, B, D, and E.

Administration of ciprofloxacin (Choice A) is not appropriate given this patient's state of septic shock. Broad gram-positive and enteric gram-negative coverage, which also covers *Pseudomonas*, is recommended. Numerous organisms that cause complicated urinary tract infections and pyelonephritis have resistance to fluoroquinolones, and they should not be used for empiric treatment in a sick patient.

Administration of gentamicin (Choice B) is not necessary and would not add significant additional coverage in this setting to justify the risk for adverse effects, especially in a patient with underlying kidney disease, given the known nephrotoxicity of aminoglycosides.

Administration of metoprolol (Choice D) is contraindicated in the setting of shock, as it impairs the body's physiological attempt to compensate for reduced tissue perfusion.

Cardioversion (Choice E) is not indicated, as the most likely explanation for the patient's tachycardia is sinus tachycardia in the setting of shock. This should be permitted to continue, as the increased heart rate (and therefore cardiac output) is compensating for diminished systemic vascular resistance in maintaining mean arterial pressure.

Educational Objective: Adrenal crisis is a life-threatening emergency that can occur in the setting of chronic adrenal insufficiency when an acute stressor causes a rapid increase in physiologic demand for cortisol that the adrenal glands are unable to meet. Initial symptoms are often vague and nonspecific, but hypotension refractory to fluid resuscitation in patients at risk should prompt the physician to administer hydrocortisone.

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✓ 24. A 72-year-old man comes to the physician because of a 3-month history of progressive shortness of breath, nonproductive cough, and fatigue. During this period, he has had early satiety resulting in a 2.3-kg (5-lb) weight loss. He has no known sick contacts. He has a 20-year history of chronic obstructive pulmonary disease and a 10-year history of hypertension. Current medications are an inhaled bronchodilator and an oral thiazide diuretic. He has smoked one pack of cigarettes daily for 50 years. He is in mild respiratory distress. He is 165 cm (5 ft 5 in) tall and weighs 52 kg (115 lb); BMI is 19 kg/m^2. His temperature is 37°C (98.6°F), pulse is 103/min, respirations are 20/min, and blood pressure is 130/90 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 87%. Examination shows no scleral icterus. There is jugular venous distention. Breath sounds are distant. There is a right ventricular heave and a loud S_2. A grade 2/6 systolic murmur is heard best over the left sternal border. The liver is tender, smooth, and pulsatile. There is no peripheral edema. His hematocrit is 50%, leukocyte count is 4500/mm^3, and platelet count is 200,000/mm^3. Which of the following is the most appropriate next step in management?

A) Digoxin therapy
B) Furosemide therapy
C) Incentive spirometry
D) Continuous positive airway pressure
E) Home oxygen therapy

Correct Answer: E.

The most appropriate next step in management is home oxygen therapy. This patient presents with right-sided heart failure secondary to chronic obstructive pulmonary disease (COPD). This is referred to as cor pulmonale (meaning “pulmonary heart” in Latin). Chronic lung disease is associated with pulmonary hypertension, and, similar to systemic hypertension causing left-sided heart failure, over time the right side of the heart fails as a result of the increased demands of pumping against elevated pulmonary arterial resistance. Patients present with signs of venous congestion, which are seen in this patient with jugular venous distension and a pulsatile liver. Structural changes to the right ventricle are evident with a palpable heave on physical examination and a loud S_2 heart sound as the pulmonic valve slaps shut under increased pulmonary pressures. Mortality in severe COPD is improved by smoking cessation and home oxygen therapy. In addition to improving peripheral oxygenation, supplemental oxygen reduces the extent of vasoconstriction that contributes to increased pulmonary vascular pressures, reducing strain on the right ventricle.

Incorrect Answers: A, B, C, and D.

Digoxin therapy (Choice A) is used in the treatment of heart failure and certain arrhythmias. In heart failure, the role of digoxin is to improve symptoms by augmenting cardiac output; however, it does not confer long-term survival benefits. For patients with COPD, smoking cessation and home oxygen therapy demonstrate the greatest improvements in symptoms and survival.

Furosemide therapy (Choice B) is a mainstay of heart failure treatment and may be required for this patient if he continues to have symptoms associated with venous congestion. Home oxygen therapy should be initiated first.

Incentive spirometry (Choice C) is useful to prevent pulmonary complications in postoperative patients and improve ventilation in patients with atelectasis. It does not have a significant role in routine management of COPD.

Continuous positive airway pressure (Choice D) is beneficial for acute exacerbations where a patient is hypoventilating as a result of airway collapse and at risk for respiratory failure. It also aids in heart failure by decreasing afterload through equalization of thoracic pressures. It is not indicated in this current setting.

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Continuous positive airway pressure (Choice D) is beneficial for acute exacerbations where a patient is hypoventilating as a result of airway collapse and at risk for respiratory failure. It also aids in heart failure by decreasing afterload through equalization of thoracic pressures. It is not indicated in this current setting.

Educational Objective: Chronic obstructive pulmonary disease is characterized by chronic, progressive deterioration in pulmonary function. In severe cases, patients develop right-sided heart failure as a result of chronically increased pulmonary vascular pressures. Supplemental oxygen and smoking cessation provide the strongest mortality benefits, and smoking cessation results in a decreased rate of pulmonary function decline as compared with patients who continue smoking.

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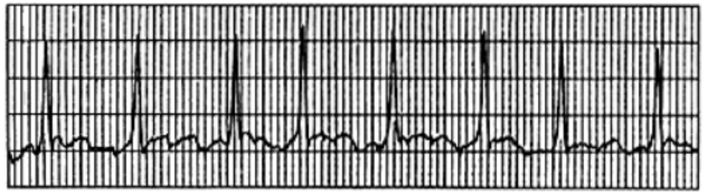

25. Four days after admission to the hospital for treatment of a myocardial infarction, a 72-year-old woman has the sudden onset of shortness of breath and confusion. She has atrial fibrillation, type 2 diabetes mellitus, essential hypertension, and hypercholesterolemia. Her medications are diltiazem, quinapril, metformin, and simvastatin. She has smoked one pack of cigarettes daily for 50 years and has drunk one glass of wine daily for 52 years. She is anxious and oriented to person but not to place or time. Her temperature is 35°C (95°F), pulse is 116/min and irregularly irregular, respirations are 30/min, and blood pressure is 92/58 mm Hg. Pulse oximetry on 100% oxygen by face mask shows an oxygen saturation of 91%. The skin is cool to the touch. Examination shows jugular venous distention. Decreased breath sounds are heard in the lung bases bilaterally. Scattered expiratory wheezes and crackles are heard bilaterally. A rub is heard in the lower lobe of the left lung. There is 2+ pretibial and pedal edema bilaterally. Laboratory studies show:

Hemoglobin	11.6 g/dL
Leukocyte count	11,000/mm^3
Segmented neutrophils	65%
Bands	3%
Lymphocytes	30%
Monocytes	2%
Serum	
Na^+	136 mEq/L
K^+	3.7 mEq/L
Cl^-	105 mEq/L
HCO_3^-	14 mEq/L
Glucose	86 mg/dL
Creatine kinase	68 U/L
Lactic acid	3.6 mEq/L (N=0.5–2)

Arterial blood gas analysis shows:

pH	7.29
Pco_2	30 mm Hg
Po_2	64 mm Hg

An ECG is shown. A chest x-ray shows cardiomegaly and pulmonary infiltrates, and pleural effusions bilaterally. Which of the following is the most appropriate next step in diagnosis?

A) Cardiac catheterization

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pH	7.29
Pco_2	30 mm Hg
Po_2	64 mm Hg

An ECG is shown. A chest x-ray shows cardiomegaly and pulmonary infiltrates, and pleural effusions bilaterally. Which of the following is the most appropriate next step in diagnosis?

A) Cardiac catheterization
B) CT angiography
C) Echocardiography
D) Measurement of serum brain natriuretic peptide concentration
E) Radionuclide myocardial scan

Correct Answer: C.

This patient is in a state of cardiogenic shock with tachycardia, borderline hypotension, cool extremities, and evidence of pulmonary and venous congestion on physical examination and imaging. It is important to rapidly identify and treat the cause, and echocardiography provides diagnostic information quickly at the bedside. Acute and subacute complications of myocardial infarction include papillary muscle rupture with subsequent mitral regurgitation, dysrhythmias, cardiogenic shock, pulmonary edema, ventricular wall rupture, and postinfarction pericarditis. Echocardiography can identify most causes of cardiogenic shock at the bedside and guide further management.

Incorrect Answers: A, B, D, and E.

Cardiac catheterization (Choice A) may be indicated if echocardiography shows evidence of stent thrombosis or features of acute coronary syndrome requiring invasive intervention. Assessment of other causes with echocardiography should be performed first.

CT angiography (Choice B) in this scenario is time-consuming and unlikely to provide actionable diagnostic information. Coronary CT angiography is useful in the outpatient setting as a noninvasive method of identifying obstructive coronary artery disease and patients at risk for major adverse cardiovascular events.

Measurement of serum brain natriuretic peptide concentration (Choice D) will not provide useful information in management of the patient's acute shock. It is expected to be increased in the setting of heart failure. This patient is displaying clear clinical signs of cardiogenic shock with recent ischemic damage to the myocardium, and urgent, definitive diagnostic testing is needed.

Radionuclide myocardial scan (Choice E) compares myocardial perfusion at rest and during exertion. It is indicated in the outpatient workup of angina, as well as assessment of myocardial viability for patients who have suffered an ischemic injury to guide revascularization management decisions.

Educational Objective: Cardiogenic shock can occur in the setting of acute myocardial infarction, severe valvular dysfunction, severe heart failure, heart block, or arrhythmia. Signs and symptoms include hypotension, cool and pale extremities, jugular venous distension, and pulmonary edema. Echocardiography is indicated to determine the underlying cause.

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✓ 26. A 2-month-old girl is brought to the clinic by her mother for a well-child examination. The mother says her daughter is exclusively breast-fed; it takes 1 hour to complete a feeding, and her daughter sweats during feedings. The patient is at the 10th percentile for weight; she was at the 50th percentile at her last examination 6 weeks ago. Other growth parameters have remained stable at the 50th percentile. Vital signs are within normal limits. The lungs are clear to auscultation. On cardiac examination, a grade 3/6 systolic murmur is heard best at the lower left sternal border. The liver edge is palpated 5 cm below the right costal margin. Which of the following is the most likely cause of this patient's failure to thrive?

A) Atrial septal defect
B) Congenital hypothyroidism
C) Fabry disease
D) Glycogen storage disease, type II (Pompe disease)
E) Inadequate breast milk supply
F) Inadequate breast-feeding technique
G) Ventricular septal defect

Correct Answer: G.

Ventricular septal defects (VSDs) are among the most common congenital heart malformations, and they may occur in isolation or in association with complex structural abnormalities. The genetic cause of VSDs is heterogeneous and includes known associations with well-defined syndromes such as Down, DiGeorge, and Holt-Oram. It may also occur in isolation and via nonspecific, random mutations and individual point mutations that are de novo. VSDs are characterized by a holosystolic murmur best heard in the lower left sternal border and may have an associated palpable thrill. VSDs result in a left-to-right shunt, which increases pulmonary blood flow. They are acyanotic lesions. If uncorrected, the increased pulmonary blood flow may result in pulmonary artery remodeling and consequent pulmonary arterial hypertension, which may cause a reversal of the shunt from right to left. This process is referred to as Eisenmenger syndrome. Clinically, fatigue with feeding, sweating with feeding, hepatomegaly, and the presence of a murmur may be the only findings.

Incorrect Answers: A, B, C, D, E, and F.

Atrial septal defect (Choice A) results in a left-to-right shunt with abnormal flow of blood from the left atrium to the right atrium, resulting in relative volume overload of the right atrium and ventricle, which presents as a fixed, split S_2, and low-grade physiologic ejection murmur on cardiac auscultation.

Congenital hypothyroidism (Choice B) is frequently asymptomatic at birth, though may present with lethargy, hypothermia, feeding problems, hoarse cry, myxedematous facies, macroglossia, hypotonia, umbilical hernia, prolonged jaundice, and dry skin, along with intellectual disability in childhood.

Fabry disease (Choice C) is an X-linked lysosomal storage disorder that results from deficiency of alpha-galactosidase A. Ocular manifestations include cataracts and retinal vascular tortuosity. Cardiac manifestations include left and right ventricular hypertrophy, and conduction defects. This patient lacks other stigmata of the condition, and is genetically female, making presentation of such rare.

Glycogen storage disease, type II (Pompe disease) (Choice D) is an inherited recessive disease that causes cardiomegaly, cardiomyopathy, hepatomegaly, and hypotonia.

Inadequate breast milk supply (Choice E) and inadequate breast-feeding technique (Choice F) can lead to breast milk or breast-feeding jaundice. Neither condition presents with a heart murmur or fatigue

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Incorrect Answers: A, B, C, D, E, and F.

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Inadequate breast milk supply (Choice E) and inadequate breast-feeding technique (Choice F) can lead to breast milk or breast-feeding jaundice. Neither condition presents with a heart murmur or fatigue with feeding.

Educational Objective: Ventricular septal defect is characterized by a holosystolic murmur best heard in the lower left sternal border. Large defects may require repair to prevent persistent shunting and infantile heart failure.

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27. A 67-year-old man comes to the emergency department because of a 12-hour history of increasingly severe generalized, cramping pain that began in his left groin and spread to his abdomen. The patient rates the pain as a 10 on a 10-point scale. He previously has noted a hernia in the left groin area. He says, "Normally I can push it back in, but this time I couldn't. I was going to wait and make an appointment with my primary care doctor, but I couldn't tolerate the pain." He has hypertension treated with verapamil and hydrochlorothiazide. The patient appears uncomfortable. Temperature is 37.4°C (99.3°F), pulse is 96/min, respirations are 20/min, and blood pressure is 140/95 mm Hg. Cardiac examination discloses an S_4 gallop. Bowel sounds are increased, and the abdomen is soft with moderate, diffuse tenderness. A tender mass is present in the left groin extending into the scrotal sac, and the skin overlying the groin is erythematous. Results of laboratory studies are shown:

Blood		Arterial blood gas analysis	
Hematocrit	45%	Po_2	75 mm Hg
Hemoglobin	15 g/dL	Pco_2	34 mm Hg
WBC	18,000/mm^3	pH	7.35
Neutrophils, segmented	70%		
Neutrophils, bands	20%		
Lymphocytes	8%		
Monocytes	2%		

The physician contacts the on-call surgeon to see the patient. The surgeon instructs the physician to attempt reduction of the hernia and to call back if unsuccessful. Which of the following is the most appropriate next step in management?

A) Administer hydromorphone and attempt manual reduction of the hernia

B) Contact the hospital administrator and report an Emergency Medical Treatment and Active Labor Act violation

C) Inform the surgeon that the patient needs to be evaluated

D) Obtain CT scan of the abdomen and call the surgeon back if there are signs of bowel obstruction

Correct Answer: C.

An incarcerated or strangulated hernia represents a surgical emergency. Strangulation presents with severe pain in the hernia site, often with overlying reactive erythema, fever, leukocytosis, and a tender, irreducible mass on examination. In extremis, sepsis and septic shock can arise from necrotic bowel. Immediate surgical exploration is necessary. On-call physicians have an obligation to act ethically, to promote the patient's best interests, and to respond to calls for patient care in a timely fashion. Additionally, on-call physicians are required under the Emergency Medical Treatment and Active Labor Act (EMTALA) to appear to perform an in-person evaluation if summoned by another physician. Failure to perform an in-person evaluation in this scenario deviates from the standard of care, may result in harm, and represents negligence, which may be interpreted as medical malpractice. When encountering a colleague who is neglecting their duties while on-call, the consulting physician should remind their colleague of this obligation and escalate the demand for the patient to be seen or to locate another surgeon if necessary. Physicians should follow appropriate guidelines for reporting EMTALA violations.

Incorrect Answers: A, B, and D.

Administering hydromorphone and attempting manual reduction of the hernia (Choice A) and obtaining a CT scan of the abdomen (Choice D) are both inappropriate. This patient demonstrates clear clinical signs of hernia strangulation. Manual reduction will not be successful in this case, and a CT scan is unlikely to provide additional useful information. The next step in management is surgical exploration.

Contacting the hospital administrator and reporting an EMTALA violation (Choice B) may be necessary if the patient is not seen. The consulting physician's priority should be to remind the on-call physician of

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Hematocrit	45%	Po_2	75 mm Hg
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Contacting the hospital administrator and reporting an EMTALA violation (Choice B) may be necessary if the patient is not seen. The consulting physician's priority should be to remind the on-call physician of their duty to see the patient, or to locate another surgeon if the on-call surgeon continues in their refusal to see the patient.

Educational Objective: On-call physicians have an obligation to act ethically, promote the patient's best interests, and to respond to calls for patient care in a timely fashion. Additionally, on-call physicians are required under the Emergency Medical Treatment and Active Labor Act (EMTALA) to appear to perform an in-person evaluation if summoned by another physician. Failure to perform an in-person evaluation in this scenario deviates from the standard of care and represents negligence, which may be interpreted as medical malpractice.

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28. A 55-year-old man comes to the office because of a 2-month history of moderate right shoulder pain. The patient says the pain occurs whenever he raises his right arm straight up in front of him or up from his side. He also reports decreased strength in his right shoulder. He says he injured his right shoulder 35 years ago during a college football game when he was hit by another player and landed shoulder-first on the ground. After the injury, he had pain in the shoulder that resolved in 3 days without treatment. He has not had any subsequent injuries to the shoulder. Medical history otherwise is unremarkable, and he takes no routine medications. Vital signs are normal. Physical examination discloses inability to resist downward pressure on the right arm when it is held straight out in front with the thumb pointing downward. Which of the following imaging studies of the right shoulder is most likely to confirm the diagnosis?

A) AP and lateral x-rays
B) Arthrography
C) MRI
D) Ultrasonography
E) No imaging studies are necessary to confirm the diagnosis

Correct Answer: C.

The rotator cuff is the group of muscles and tendons that act to seat the humeral head directly into the center of the glenoid during motion of the shoulder. These muscles also act in concert with other muscles in the shoulder to internally and externally rotate, abduct, and adduct the shoulder. These muscles include the subscapularis, teres minor, supraspinatus, and infraspinatus. The prime movements of these muscles at the glenohumeral joint include internal rotation (subscapularis), external rotation (teres minor and infraspinatus), and abduction (supraspinatus). The coupling and antagonistic action of these muscles seats the humeral head in the glenoid and provides a stable pivot upon which the larger, more powerful muscles of the shoulder can act, such as the latissimus dorsi, deltoid, and pectoralis major. A rotator cuff tear typically occurs at the insertion of the tendons of the rotator cuff on the humeral head. Commonly, this occurs in the supraspinatus tendon; however, tears can occur in any of the rotator cuff tendons or at the myotendinous junction. Risk factors for rotator cuff tears include heavy labor, repetitive overhead lifting, diabetes mellitus, and vascular disease. Chronic disease leading to tendon degeneration as well as acute or repetitive microtrauma are thought to contribute to eventual tendon failure. The classic presentation of a rotator cuff tear is with pain and weakness in one of the axes of motion corresponding with the associated rotator cuff muscle. Late manifestations of a tear include clinically appreciable atrophy of the corresponding muscle. MRI is typically indicated for patients with rotator cuff injury to delineate the extent of injury and to determine the need for or to plan for surgical intervention.

Incorrect Answers: A, B, D, and E.

AP and lateral x-rays (Choice A) of the shoulder would be indicated if acute traumatic fracture or dislocation was suspected.

Arthrography (Choice B) is a diagnostic modality to evaluate joint structure, function, and intra-articular pathologies. This patient's presentation is more consistent with an extra-articular pathology.

Ultrasonography (Choice D) of the shoulder is limited and can evaluate for joint effusions or acute soft tissue inflammation such as bursitis. MRI, x-ray, and CT imaging modalities are more sensitive and specific for shoulder pathologies.

No imaging studies are necessary to confirm the diagnosis (Choice E) is incorrect, as rotator cuff injury can be suspected clinically but requires imaging for definitive diagnosis.

Educational Objective: Rotator cuff injuries typically present with pain and weakness in the direction of shoulder motion that corresponds with the action of the associated rotator cuff muscle. MRI is used to confirm the diagnosis of rotator cuff injury.

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✓ 29. A 25-year-old woman is brought to the emergency department 45 minutes after the onset of dizziness. Her symptom began after she consumed 1800 mL of water during a contest in which participants tried to drink the most water in 15 minutes. She has no history of serious illness and takes no medications. On arrival, she is alert and fully oriented. Her pulse is 88/min and regular, respirations are 16/min, and blood pressure is 110/80 mm Hg. Examination, including neurologic examination, shows no abnormalities. Laboratory studies show:

Serum	
Na^+	128 mEq/L
K^+	3.8 mEq/L
Urea nitrogen	5 mg/dL
Glucose	80 mg/dL
Creatinine	0.7 mg/dL
Urine specific gravity	1.005

Administration of which of the following is the most appropriate next step in management?

A) ADH (vasopressin)
B) Furosemide
C) 0.9% Saline
D) 3% Saline
E) No pharmacotherapy is indicated

Correct Answer: E.

Excess free water consumption over a rapid period can lead to acute hyponatremia, which, if severe, may include neurologic manifestations including altered mental status, seizures, central nervous system herniation syndromes, coma, and death. Acute consumption of free water results in dilution of renal interstitial concentration gradients and limits concentrating ability. Resulting serum and urine abnormalities include hyponatremia, low serum osmolality, and low urine osmolality. Hyponatremia, if mild, does not generally cause symptoms or objective examination findings. Treatment of hyponatremia involves treatment of any underlying disease and gradual sodium correction, typically with fluid restriction in cases of psychogenic polydipsia or syndrome of inappropriate antidiuretic hormone. A safe rate of sodium correction is generally no more than 6 to 12 mEq/day. When hyponatremia is corrected too rapidly, extracellular sodium exerts osmotic pressure that leads to the rapid efflux of water from neurons, which can lead to demyelination. The pons is particularly vulnerable to demyelinating injury, and the rapid correction of hyponatremia can result in central pontine myelinolysis. In cases of acute, severe hyponatremia with neurologic symptoms of consequence (eg, seizure, coma, herniation, altered mental status), correction with hypertonic saline is appropriate.

Incorrect Answers: A, B, C, and D.

ADH (vasopressin) (Choice A) administration leads to the development of hypotonic, euvolemic hyponatremia, which would worsen the patient's condition.

Furosemide (Choice B) is a loop diuretic, which increases the delivery of Na^+ and K^+ to the collecting duct by blocking the $Na^+/K^+/2Cl^-$ cotransporter in the thick ascending loop of Henle. Loop diuretics are associated with hypokalemia, hypocalcemia, and hypomagnesemia. In the event of hyponatremia resulting from hypervolemia, diuretics may be appropriate. However, this patient is clinically euvolemic and does not have a precipitating condition such as heart failure to argue for the use of a diuretic.

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Urine specific gravity	1.005

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0.9% saline (Choice C) can be helpful if hyponatremia does not correct with fluid restriction. However, fluid restriction is the first step in management of asymptomatic mild hyponatremia in the setting of excess free water intake.

3% saline (Choice D) is not appropriate for this patient. Apart from its use in nonelectrolyte-related cerebral herniation syndromes, hypertonic saline is reserved for patients with severe, acutely symptomatic hyponatremia.

Educational Objective: Excess free water intake can result in hyponatremia. Treatment of hyponatremia involves treatment of any underlying disease and gradual sodium correction.

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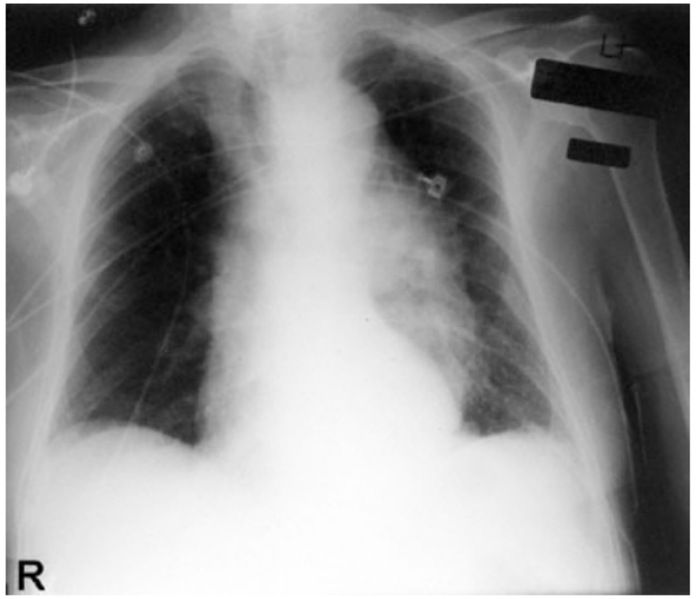
30. A previously healthy 57-year-old man is brought to the emergency department immediately after being involved in a head-on motor vehicle collision. He was the driver and was wearing a seat belt with a shoulder strap. On arrival, he is alert and oriented to person, place, and time. He says that he does not think he had loss of consciousness but feels sore all over his body. His temperature is 36.7°C (98°F), pulse is 100/min, respirations are 14/min, and blood pressure is 140/70 mm Hg. Pulse oximetry on 2 L/min of oxygen via nasal cannula shows an oxygen saturation of 99%. Physical examination and an ECG show no abnormalities. A chest x-ray is shown. Which of the following is the most likely diagnosis?



A) Aortic disruption
B) Aspiration pneumonia
C) Perforation of the esophagus
D) Perforation of an intra-abdominal viscus
E) Pericardial effusion
F) Pneumothorax

Correct Answer: A.

Traumatic disruption of the aorta can occur in deceleration injuries such as motor vehicle collisions or falls. Patients can present with tearing chest pain, hypotension, hemodynamic instability, and tachycardia. Many patients with complete transection or rupture of the aorta do not survive to evaluation and many decompensate abruptly. The gold standard of diagnosis involves CT angiography of the aorta; however, hypotensive patients may be too unstable to tolerate a CT scan. A chest x-ray can be obtained, which may show a widened mediastinum as seen in this patient. CT angiography of the chest can differentiate types of blunt aortic injury, including aortic dissection, aortic rupture, or pseudoaneurysm. Repair of traumatic dissection of the aorta can be performed via open repair or endovascular repair. Such patients are often critically ill and hemodynamically unstable. Attention must be paid to hemodynamic support, reversal of coagulopathy if present, and surgical evaluation without delay for advanced imaging in cases of high pretest probability.

Incorrect Answers: B, C, D, E, and F.

Aspiration pneumonia (Choice B) presents as shortness of breath, cough productive of sputum, and fever, with a focal consolidation on chest x-ray, often in the superior segment of the inferior right lobe of lung.

Perforation of the esophagus (Choice C) can occur from multiple causes, including forceful vomiting (Boerhaave syndrome), trauma, invasive malignancy, and inflammation. Translocation of gastric contents into the mediastinum can cause rapidly progressive infection and sepsis from mediastinitis. Esophageal perforation is a surgical emergency and is diagnosed through water-soluble contrast esophagography.

Perforation of an intra-abdominal viscus (Choice D) may lead to severe, diffuse abdominal pain, nausea, vomiting, high fever, tachycardia, and septic shock. Bowel contents in the peritoneal space cause rapid infection in the form of peritonitis, marked by abdominal rigidity, rebound tenderness, and guarding. Perforated viscus and resultant peritonitis is a surgical emergency that requires exploratory laparotomy.

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D) Perforation of an intra-abdominal viscus

E) Pericardial effusion

F) Pneumothorax

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Pericardial effusion (Choice E) presents with hypotension, shortness of breath, distant heart sounds, jugular venous distention, and pulsus paradoxus if tamponade is present. Muffled heart sounds may be the only clue if tamponade physiology is absent. Rapid decompression of the pericardial space is required to prevent ongoing shock. X-ray imaging is generally normal in acute tamponade.

Pneumothorax (Choice F) occurs as air accumulates within the pleural space as a result of injury of the bronchopulmonary parenchyma or penetrating trauma violating the pleura. On physical examination, a pneumothorax presents as unilateral decreased breath sounds with hyperresonance to percussion. Pneumothorax can appear on chest x-ray as radiolucent air and the absence of interstitial lung markings in the pleural space adjacent to the lung parenchyma.

Educational Objective: Traumatic disruption of the aorta can occur in sudden deceleration injuries, and patients can present with chest pain and hemodynamic instability. Chest x-ray can show a widened mediastinum.

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31. A 77-year-old man comes to the physician because of a 2-week history of increasing back pain. Eight years ago, he was diagnosed with prostate cancer. Gonadotropin inhibitor therapy was begun, and he was asymptomatic until 2 months ago; metastatic lesions at L3 and T8 were confirmed at that time. Ibuprofen therapy sufficiently controlled the pain for 1 month, after which oxycodone (5 mg every 4 hours) and laxatives were added to the medication regimen. At his last visit 1 month ago, he reported his pain as between 0 and 2 on a 10-point scale. He now describes his pain as 4 to 5 on a 10-point scale. Which of the following is the most appropriate next step in management?

A) Massage therapy and reevaluation in 1 week
B) Add oral acetaminophen therapy to the regimen
C) Begin intravenous morphine therapy
D) Begin oral propoxyphene therapy
E) Increase the oxycodone dosage by 25% to 50%
F) Switch from codeine to meperidine therapy

Correct Answer: E.

Opioids are potent analgesics that reduce the sensation of pain via delta, kappa, and particularly mu opioid receptor agonism throughout the central and peripheral nervous systems. Despite their high potential to lead to opioid use disorder and overdose death, opioid agonists are useful for the management of pain in certain situations, such as in the perioperative period, following trauma, and in the setting of cancer, which can produce severe, chronic pain that is often intractable to other modalities. Treatment with opioids typically employs mu opioid receptor agonists, such as morphine, oxycodone, hydromorphone, fentanyl, or methadone. Dose titration is often necessary after beginning initial therapy. Oral opioids are typically administered on a fixed, scheduled dose. Breakthrough or progressive pain can be treated by increasing the scheduled dose, usually by at least 25%. The percentage increase in dosage is informed by the severity of pain and assessment of other comorbidities and risk factors for overdose. Patients with uncontrolled pain on high oral doses of opioids may benefit from transdermal patches or intravenous administration.

Incorrect Answers: A, B, C, D, and F.

Massage therapy and reevaluation in 1 week (Choice A) is incorrect. This patient presents with bone pain caused by vertebral metastases, which will not respond to massage. While nonpharmacologic techniques of pain management play an important role in addressing pain, this strategy alone is inadequate in this scenario.

Add oral acetaminophen therapy to the regimen (Choice B) is incorrect. Acetaminophen provides a relatively small amount of analgesia in comparison to oxycodone and is likely to be inadequate for addressing this patient's pain. Additionally, acetaminophen is associated with hepatotoxicity if used at high doses for prolonged periods.

Begin intravenous morphine therapy (Choice C) is an appropriate strategy for intractable pain but is premature at this point. A more appropriate initial strategy is to increase the dose of oxycodone.

Begin oral propoxyphene therapy (Choice D) is incorrect. Propoxyphene was an opioid that was previously used for analgesia and as a cough suppressant. It has been removed from the market in the United States because of an association with fatal cardiac arrhythmias.

Switch from codeine to meperidine therapy (Choice F) is incorrect. Meperidine is a pure mu opioid receptor agonist but is not recommended for use in patients with cancer because of its long half-life and adverse effect profile (including seizures and delirium), creating a high risk for meperidine toxicity with repeated dosing.

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Educational Objective: Opioids are useful for the management of cancer pain, which can be severe, chronic, and intractable to other treatment modalities. Oral opioids are typically administered on a fixed, scheduled dose. Breakthrough or progressive pain can be treated by increasing the scheduled dose, usually by at least 25%. Patients with uncontrolled pain on high oral doses of opioids may benefit from transdermal patches or intravenous administration.

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32. An 18-year-old woman comes to the physician for a follow-up examination. She has a 5-year history of asthma treated with inhaled albuterol as needed and inhaled beclomethasone daily. She has never required treatment in the hospital for an acute episode. She says that her asthma is worse after she spends prolonged periods of time indoors and after she visits homes of friends who own cats. Her house has hardwood floors, which she and her family clean every week. She sleeps with her windows closed and changes her bedding regularly. She does not smoke or drink alcohol. Examination shows no abnormalities. The lungs are clear to auscultation. Skin testing shows allergies to dust mites and cat dander. The physician advises the patient to avoid direct contact with cats. Which of the following environmental changes is likely to be most helpful in preventing exacerbations of this patient's asthma?

A) Humidifier use
B) Placement of carpet in her bedroom
C) Sleeping with the windows open
D) Use of allergen-impermeable mattress and pillow covers
E) Vacuuming the floors of her house daily

Correct Answer: D.

Preventative management of asthma involves controller therapy and avoidance of known triggers. Asthma triggers can be divided into allergenic and nonallergenic categories. Nonallergenic triggers such as cold exposure and exercise can be anticipated. Allergenic triggers can be more difficult to control, especially in indoor environments. The most common indoor allergens are dust mites, pets, and molds. This patient has noticed an association between her asthma symptoms and being indoors around cats. Skin testing confirms her hypersensitivity to dust mites and cat dander. One of the most effective proven strategies for minimizing dust mite exposure is the use of an allergen-impermeable mattress and pillow covers. These have been shown to reduce asthma symptoms in sensitive patients.

Incorrect Answers: A, B, C, and E.

Humidifier use (Choice A) can help decrease asthma symptoms, particularly if cold or dry air has been identified as a trigger. This patient's positive skin testing for dust mite sensitivity indicates that use of an allergen-impermeable mattress and pillow covers will be more effective.

Placement of carpet in her bedroom (Choice B) should be avoided, as carpeting can harbor allergens that are dispersed with movement through the room. Removal of carpeting may improve a patient's symptoms.

Sleeping with the windows open (Choice C) should be avoided as well, as it increases exposure to smoke, pollen, and other airborne allergens that may make asthma symptoms worse while providing limited benefit in reducing the presence of indoor allergens.

Vacuuming the floors of her house daily (Choice E) is not recommended. Though it does reduce the burden of indoor allergens, the act of vacuuming can distribute allergens throughout the air and worsen asthma symptoms.

Educational Objective: Use of an allergen-impermeable mattress and pillow covers is effective in reducing asthma symptoms for patients sensitive to indoor allergens. Skin testing for specific hypersensitivities can help guide management strategies.

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33. A 44-year-old man comes to the office because of a 6-month history of intermittent moderate headache. He has had one to two headaches weekly since residents of the neighboring apartment got a dog that barks a lot. He says he has had recurrent thoughts about killing the dog during the past 6 months, but he has no intent or plan to harm the animal. He worries that his headaches are punishment for these thoughts about killing; he says he realizes this does not make sense but remains concerned. He vacuums 2 hours daily because he is worried that dog hair is coming into his apartment. He has no history of serious illness. His only medication is acetaminophen, which resolves his headaches. He drinks two to three 12-oz beers on weekends. His pulse is 72/min, respirations are 16/min, and blood pressure is 150/105 mm Hg. Physical examination shows no other abnormalities. Mental status examination shows an anxious affect. Which of the following is the most likely diagnosis?

A) Delusional disorder
B) Generalized anxiety disorder
C) Obsessive-compulsive disorder
D) Paranoid personality disorder
E) Somatic symptom disorder

Correct Answer: C.

Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). By definition, the compulsions are excessive or do not realistically address the obsessive fears, and patients commonly recognize the irrationality of their compulsions. This patient's thoughts of killing his neighbor's dog, as well as worry about dog hair entering his apartment, represent obsessions, while his excessive vacuuming represents a compulsion. Treatment includes use of selective serotonin reuptake inhibitors (SSRIs, eg, fluoxetine) or cognitive behavioral therapy with a focus on exposure to the discomfort and suppressing the compulsion after experiencing the obsession. SSRIs have the lowest adverse effect burden of antidepressant medications. Clomipramine (a tricyclic antidepressant) and venlafaxine (a selective serotonin-norepinephrine reuptake inhibitor antidepressant) are effective second-line agents.

Incorrect Answers: A, B, D, and E.

Delusional disorder (Choice A) features one or more delusions for a month or longer with no other psychotic symptoms. This patient exhibits both obsessions and compulsions that are more consistent with a diagnosis of OCD.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features excessive worrying about a range of topics with associated functional impairment. This patient's unwanted, intrusive thoughts about dog hair entering his apartment are more consistent with an obsession.

Paranoid personality disorder (Choice D) is a cluster A personality disorder characterized by a pervasive mistrust of others and viewing others as possessing malicious intent.

Somatic symptom disorder (Choice E) is characterized by preoccupation with one or more somatic symptoms such that these symptoms disrupt the patient's daily life. Patients persistently devote excessive time and energy to these symptoms or related health concerns (eg, repeatedly going to the doctor).

Educational Objective: Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). OCD is commonly treated with cognitive behavioral therapy or selective serotonin reuptake inhibitor medications.

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34. A 27-year-old primigravid woman at 32 weeks' gestation comes to the emergency department because of a 2-day history of progressive drooping of the right side of her face, an inability to close her right eye, and right-sided facial pain. She has not had loss of hearing or balance. Her pregnancy had been uncomplicated. She has no personal or family history of serious illness. Her temperature is 37°C (98.6°F), pulse is 88/min, respirations are 16/min, and blood pressure is 140/82 mm Hg. Examination of the face shows paralysis on the right side and an inability to close the right eye. The patient moves her head stiffly; there is no nuchal rigidity. Heart sounds are normal. A grade 2/6 holosystolic murmur is heard best at the apex. The abdomen is soft. The fundal height is 32 cm. There is mild edema of the lower extremities. Muscle strength is normal. Deep tendon reflexes are 2+. Which of the following is the most appropriate next step in management?

A) Carotid ultrasonography
B) CT scan of the head
C) Corticosteroid therapy
D) Angiography of the brain
E) Nerve conduction studies

Correct Answer: C.

Complete paralysis of one side of the face with no other neurologic lesion is consistent with an ipsilateral lower motor neuron lesion of the facial nerve (cranial nerve VII) as in Bell palsy. Bell palsy, also known as cranial nerve VII palsy, may be a result of viral infection or inflammation of the nerve. It presents with unilateral weakness of the facial muscles, including those of the forehead. It is differentiated from ischemic stroke, which typically demonstrates intact forehead musculature, as these muscles are dually innervated by upper motor neurons from bilateral precentral gyri. Lesions involving the lower motor neurons of facial expression (eg, facial nerve inflammation in Bell palsy) affect the forehead and lower face together. Bell palsy incidence and severity are increased in pregnancy, and cases typically arise in the third trimester or postpartum period. Treatment of Bell palsy involves corticosteroid therapy and, occasionally, antivirals depending on severity. Supportive care measures such as eye patches and artificial tears are appropriate to limit ocular complications.

Incorrect Answers: A, B, D, and E.

Carotid ultrasonography (Choice A) is useful for the diagnosis of carotid stenosis or cerebrovascular accidents but has no significant role in the diagnosis of clear cases of Bell palsy.

CT scan of the head (Choice B) should be considered for patients with focal neurologic deficits or severe, sudden onset headache, to rule out hemorrhagic stroke or subarachnoid hemorrhage. This patient does not have a headache, and the neurologic deficits reported are consistent with Bell palsy. A CT scan would likely provide little additional diagnostic information and would expose this patient and fetus to unnecessary radiation.

Angiography of the brain (Choice D) can be diagnostic for large vessel occlusions of cerebral arteries causing ischemic stroke. This patient's neurologic deficits are secondary to a cranial nerve palsy, not acute ischemic stroke.

Nerve conduction studies (Choice E) are used for the diagnosis of muscular weakness or peripheral nerve palsies. Bell palsy is a clinical diagnosis, and nerve conduction studies are not typically required for diagnosis.

Educational Objective: Bell palsy may result from viral infection or inflammation of the facial nerve and presents with unilateral weakness of the facial muscles, including those of the forehead. Corticosteroid therapy is the mainstay of treatment.

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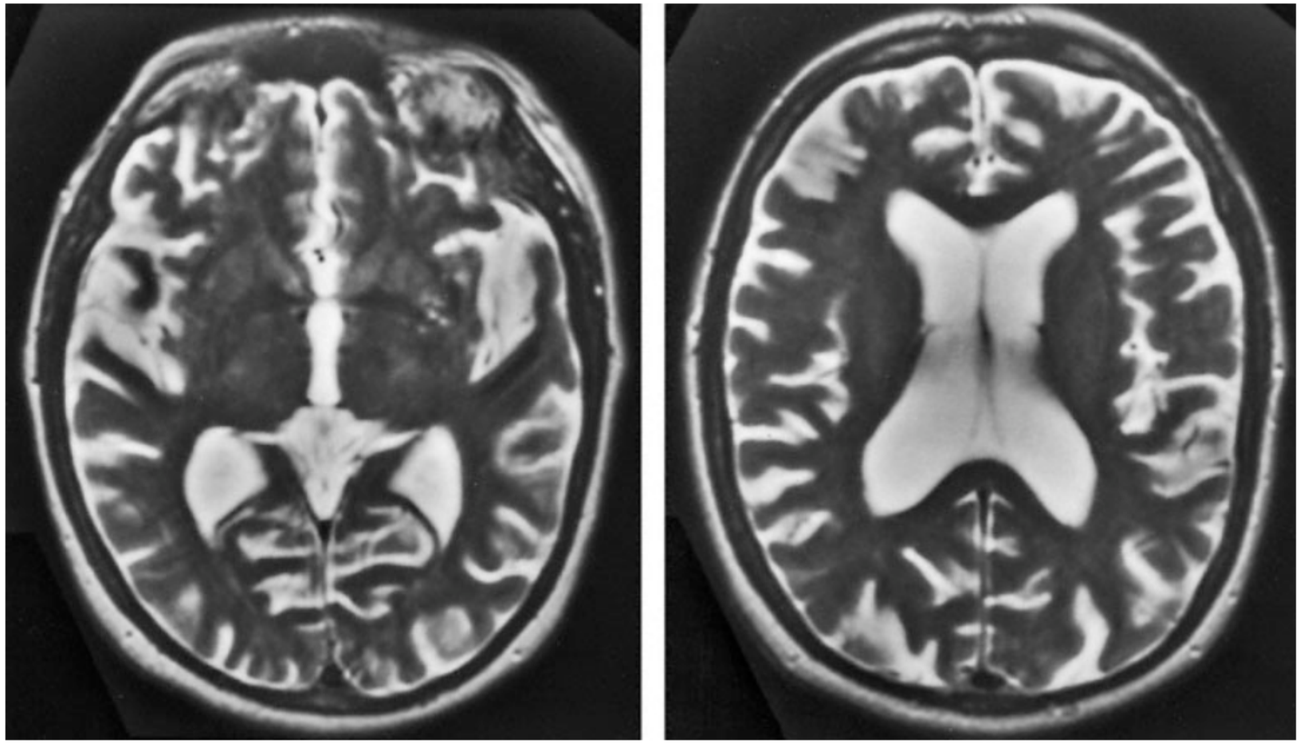

35. A 73-year-old woman is brought to the clinic by her husband because of a 6-month history of progressive memory difficulty. During this time, she has misplaced objects more frequently than usual and has had trouble following recipes. Six days ago, she became lost while walking their dog in their neighborhood. Today, she forgot that their daughter had called the previous day. The patient has type 2 diabetes mellitus and hypertension. Her medications are metformin and lisinopril. She does not smoke cigarettes or drink alcohol. Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, she is oriented to person but not to place or time. She recalls zero of three objects after 5 minutes. She makes four errors when performing serial sevens. She can name the US President and Vice President. She can name eight animals in 1 minute. The remainder of the examination shows no abnormalities. Results of a complete blood count, her erythrocyte sedimentation rate, and results of liver and thyroid function tests are within the reference ranges. VDRL testing for syphilis is negative. MRIs of the brain are shown. Which of the following is the most appropriate next step in management?

A) Deep brain stimulation
B) Placement of a ventriculoperitoneal shunt
C) Transcranial magnetic stimulation
D) Treatment with an acetylcholine precursor

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A) Deep brain stimulation
B) Placement of a ventriculoperitoneal shunt
C) Transcranial magnetic stimulation
D) Treatment with an acetylcholine precursor
E) Treatment with a cholinesterase inhibitor
F) Treatment with a postsynaptic choline receptor agonist

Correct Answer: E.

The patient is presenting with classic signs and symptoms of dementia. Dementia, Alzheimer type, is the most prevalent dementia, presenting with progressive cognitive decline that begins with short-term memory impairment, progresses to apraxia and language abnormalities, and culminates in behavioral and personality changes preventing the patient from performing basic activities of daily living. Dementia, Alzheimer type, is postulated to result from decreased cholinergic signaling in the cortex and basal forebrain. Acetylcholinesterase normally hydrolyzes acetylcholine in synaptic clefts. Treatment with a cholinesterase inhibitor, such as donepezil, noncompetitively and reversibly inhibits acetylcholinesterase activity and thereby increases the amount of synaptic acetylcholine available for neurotransmission. Though these agents may slow the rate of cognitive decline and modestly improve functionality, they are not curative.

Incorrect Answers: A, B, C, D, and F.

Deep brain stimulation (Choice A), in which electrodes are implanted into brain tissue, is an effective treatment modality for alleviating motor symptoms of Parkinson disease. It does not have a role in treatment of dementia, Alzheimer type.

Placement of a ventriculoperitoneal shunt (Choice B) is used to treat select patients with normal pressure hydrocephalus (NPH). NPH classically presents with the triad of cognitive impairment, gait instability, and urinary incontinence. Ventriculomegaly is characteristic, though it is a nonspecific finding that is also seen in dementia, Alzheimer type, as a result of atrophy of the brain parenchyma.

Transcranial magnetic stimulation (Choice C) is a treatment for unipolar major depressive disorder for patients that do not respond to pharmacotherapy or psychotherapy. It is important to screen patients for depressive symptoms, as they often present with reversible cognitive impairments in older adults.

Treatment with an acetylcholine precursor (Choice D), such as choline, and treatment with a postsynaptic choline receptor agonist (Choice F) have not been shown to be effective in treating dementia, Alzheimer type, despite the pathophysiology of the disease being associated with acetylcholine deficiency in certain regions of the brain.

Educational Objective: Cognitive impairment in dementia, Alzheimer type, is related to decreased acetylcholine signaling in the cortex. Donepezil and other cholinesterase inhibitors decrease degradation of acetylcholine and therefore increase the amount of acetylcholine available for synaptic transmission, showing a modest improvement in symptoms.

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36. A previously healthy 77-year-old man comes to the emergency department because of a 6-hour history of increasingly severe, nonradiating lower abdominal pain. He also has had urinary urgency during this time but has not been able to void for 8 hours. He has not had fever, chills, diarrhea, nausea, or vomiting. Vital signs are within normal limits. On examination, there is fullness in the midline from the umbilicus to the pubic symphysis; the area is tender to palpation, but there are no peritoneal signs. Rectal examination shows an enlarged prostate; sphincter tone is normal, and no masses are palpable. Which of the following is the most likely diagnosis?

A) Bacterial prostatitis
B) Benign prostatic hyperplasia
C) Cecal volvulus
D) Prostatic adenocarcinoma
E) Sigmoid volvulus
F) Urinary tract infection

Correct Answer: B.

Benign prostatic hyperplasia (BPH) affects middle-aged and elderly male patients, and it occurs as a result of excess growth of tissue in the central zone of the prostate causing lower urinary tract obstruction. BPH presents with urinary dribbling and incontinence, difficulty starting or maintaining a urinary stream, nocturia, the need to frequently urinate, and incomplete voiding. These symptoms are typically insidious in onset, chronic, and progressive. Urethral or bladder outlet obstruction may lead to acute symptoms of pelvic pain along with an inability to void, and may predispose to cystitis, hydronephrosis, or pyelonephritis. The diagnosis of BPH is made by history, physical examination, and urodynamic testing, along with ruling out alternate diagnoses (eg, prostatic malignancy). Treatment includes supportive care, α-blockers (eg, tamsulosin), 5-α-reductase inhibitors (eg, finasteride), or surgery. Acute obstruction can be managed with catheterization in order to decompress the urinary bladder and prevent acute complications of prolonged bladder outlet obstruction, such as bladder rupture, urothelial cell atrophy or necrosis, hydroureter, hydronephrosis, postrenal azotemia, and/or end-stage kidney disease.

Incorrect Answers: A, C, D, E, and F.

Bacterial prostatitis (Choice A) may present with urinary retention, but also typically presents with fever, chills, malaise, dysuria, pyuria, and intense pain. The diagnosis is suspected clinically and often requires imaging for diagnosis of prostatic inflammation or abscess as digital rectal examination is considered relatively contraindicated due to risk for hematogenous seeding with compression, though evidence for this hypothetical risk is lacking.

Cecal volvulus (Choice C) results from twisting of the cecal mesentery and can be a cause of large bowel obstruction. Similarly, sigmoid volvulus (Choice E) results from twisting of the sigmoid mesentery, which can lead to large bowel obstruction and potential rupture or intestinal necrosis if not treated. It typically demonstrates a coffee-bean appearance on abdominal x-rays. Neither cecal nor sigmoid volvulus commonly leads to urinary retention.

Prostatic adenocarcinoma (Choice D) is commonly asymptomatic but can present with urinary symptoms, such as urinary hesitancy or hematuria, or bone pain if metastatic. It does not commonly cause urethral or bladder outlet obstruction, which occur more frequently as a result of BPH.

Urinary tract infection (Choice F) may occur in the setting of BPH and bladder outlet obstruction. This patient's acute symptoms of inability to void and pelvic pain are more suggestive of bladder outlet obstruction secondary to BPH than a urinary tract infection, which typically presents with dysuria.

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A) Bacterial prostatitis
B) Benign prostatic hyperplasia
C) Cecal volvulus
D) Prostatic adenocarcinoma
E) Sigmoid volvulus
F) Urinary tract infection

Correct Answer: B.

Benign prostatic hyperplasia (BPH) affects middle-aged and elderly male patients, and it occurs as a result of excess growth of tissue in the central zone of the prostate causing lower urinary tract obstruction. BPH presents with urinary dribbling and incontinence, difficulty starting or maintaining a urinary stream, nocturia, the need to frequently urinate, and incomplete voiding. These symptoms are typically insidious in onset, chronic, and progressive. Urethral or bladder outlet obstruction may lead to acute symptoms of pelvic pain along with an inability to void, and may predispose to cystitis, hydronephrosis, or pyelonephritis. The diagnosis of BPH is made by history, physical examination, and urodynamic testing, along with ruling out alternate diagnoses (eg, prostatic malignancy). Treatment includes supportive care, α-blockers (eg, tamsulosin), 5-α-reductase inhibitors (eg, finasteride), or surgery. Acute obstruction can be managed with catheterization in order to decompress the urinary bladder and prevent acute complications of prolonged bladder outlet obstruction, such as bladder rupture, urothelial cell atrophy or necrosis, hydroureter, hydronephrosis, postrenal azotemia, and/or end-stage kidney disease.

Incorrect Answers: A, C, D, E, and F.

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Cecal volvulus (Choice C) results from twisting of the cecal mesentery and can be a cause of large bowel obstruction. Similarly, sigmoid volvulus (Choice E) results from twisting of the sigmoid mesentery, which can lead to large bowel obstruction and potential rupture or intestinal necrosis if not treated. It typically demonstrates a coffee-bean appearance on abdominal x-rays. Neither cecal nor sigmoid volvulus commonly leads to urinary retention.

Prostatic adenocarcinoma (Choice D) is commonly asymptomatic but can present with urinary symptoms, such as urinary hesitancy or hematuria, or bone pain if metastatic. It does not commonly cause urethral or bladder outlet obstruction, which occur more frequently as a result of BPH.

Urinary tract infection (Choice F) may occur in the setting of BPH and bladder outlet obstruction. This patient's acute symptoms of inability to void and pelvic pain are more suggestive of bladder outlet obstruction secondary to BPH than a urinary tract infection, which typically presents with dysuria.

Educational Objective: Benign prostatic hyperplasia presents in middle-aged to elderly males with urinary dribbling and incontinence, hesitancy, urgency, difficulty starting or maintaining a urinary stream, and nocturia. Urethral or bladder outlet obstruction may occur and present with acute symptoms of pelvic pain and inability to void. Treatment is with catheterization.

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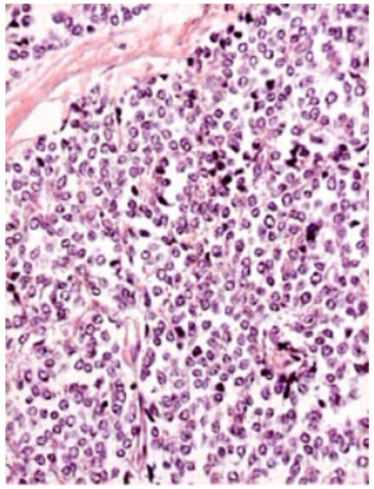
37. A 6-year-old boy is brought to the emergency department by his parents because of a 2-hour history of severe right leg pain and refusal to walk. They say he has intermittently reported pain in his leg during the past 2 weeks. He has no history of trauma or serious illness and receives no medications. Growth and development are appropriate for age. His temperature is 38.1°C (100.5°F), pulse is 100/min, and blood pressure is 100/80 mm Hg. There is warmth and tenderness to palpation of the proximal aspect of the right tibia with an associated firm mass. Distal pulses are intact. Range of motion of the right knee is limited by pain. Muscle strength in the right lower extremity is 4/5 because of pain and 5/5 elsewhere. Sensation is intact. Laboratory studies show a hemoglobin concentration of 10 g/dL, leukocyte count of 20,000/mm^3, and erythrocyte sedimentation rate of 10 mm/h. X-rays show a 6-cm, poorly defined lytic lesion in the proximal tibial metadiaphysis with adjacent periosteal reaction. The results of a biopsy are shown. Which of the following is the most likely diagnosis?



A) Acute lymphoblastic leukemia
B) Eosinophilic granuloma
C) Ewing sarcoma
D) Osteoid osteoma
E) Osteomyelitis

Correct Answer: C.

Ewing sarcoma is a primary bone malignancy that typically presents in childhood, adolescence, or early adulthood, and occurs frequently in the long bones of the extremities, such as the femur or tibia, or in the axial skeleton, such as in the pelvis. Patients typically present with the insidious onset of dull pain that may be suddenly exacerbated by exercise or minor trauma. The neoplasm is derived from a bone mesenchymal precursor and is driven by a t(11;22) chromosomal translocation, which results in the formation of an oncogenic fusion protein. X-rays may show elevated periosteum and layered neocortex formation. The diagnosis is confirmed by biopsy, which shows multiple small, round, blue cells. The prognosis is often poor for patients who are older at initial presentation, with axial skeletal involvement, or with distant metastases. Treatment is both local, with surgical excision or radiation therapy, and systemic, usually with a combination chemotherapy regimen.

Incorrect Answers: A, B, D, and E.

Acute lymphoblastic leukemia (Choice A) is a common pediatric malignancy of B- or T-lymphocytes that may present with malaise, fatigue, weight loss, splenomegaly, lymphadenopathy, anemia, and thrombocytopenia, with circulating leukemic blasts on peripheral blood smear. Bone lesions are atypical.

Eosinophilic granuloma (Choice B) is a form of Langerhans cell histiocytosis that primarily involves the bones. In children, these lytic bone lesions are commonly seen in the skull.

Osteoid osteoma (Choice D) is a benign bony tumor that commonly occurs in long bones and presents with pain and refusal to bear weight. A characteristic radiolucent nidus with a surrounding osteosclerotic reaction is seen on x-ray and CT scan.

Osteomyelitis (Choice E) is an infection of bone and bone marrow that typically presents acutely, subacutely, or chronically from direct inoculation or hematogenous spread. Patients typically report pain, difficulty bearing weight, and overlying erythema.

Educational Objective: Ewing sarcoma is a primary bone malignancy that typically presents in childhood, adolescence, or early adulthood with bone pain exacerbated by exercise or minor trauma. The most frequent sites of involvement are the long bones of the extremities, such as the femur or tibia, or the axial skeleton, such as the pelvis. X-rays may show elevated periosteum and layered neocortex formation.

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38. A 39-year-old man comes to the office because of a 1-month history of intermittent regurgitation and constipation. He has regurgitated undigested food four times weekly. He previously had daily bowel movements; during the past month, he has had a bowel movement every 3 to 4 days. He also has a 1-year history of progressive difficulty swallowing. He says initially he had difficulty swallowing solids. He now also has difficulty swallowing liquids. When he eats, he occasionally has moderate pain in the lower sternal area that radiates upward. He emigrated from Brazil 5 years ago. Vital signs are within normal limits. Examination shows no abnormalities. A chest x-ray shows a dilated esophagus with an air-fluid level. Which of the following is the most likely diagnosis?

A) Barrett esophagus
B) Nutcracker esophagus
C) Schatzki ring
D) South American trypanosomiasis
E) Systemic sclerosis (scleroderma)

Correct Answer: D.

South American trypanosomiasis, or Chagas disease, results from infection with the parasitic, flagellate protozoan *Trypanosoma cruzi*. *T. cruzi* is acquired through the bites of Reduviidae insects, a species widely found throughout South America, Central America, and areas of the southern United States. Reduviidae insects are nocturnal and feed on sleeping human hosts. They are common in rural areas and infest thatched roofs, cracks, or holes in poorly built housing. South American trypanosomiasis manifests with an early, acute stage characterized by mild, nonspecific symptoms of fever, malaise, and lymphadenopathy or splenomegaly, which can last for 1 to 2 months and resolve spontaneously. There may be mild swelling and erythema at the site of the bite, commonly on the eyelids or near the mouth. South American trypanosomiasis is typically curable if treatment is initiated promptly during the acute stage. If not detected or treated during the acute stage, chronic infection typically ensues, which is not curable. Chronic South American trypanosomiasis is characterized by cardiac manifestations, including dilated cardiomyopathy, arrhythmia, and congestive heart failure, along with gastrointestinal manifestations, such as constipation or megaesophagus, which can produce dysphagia, odynophagia, and weight loss. The diagnosis is confirmed with a variety of tests depending on the chronicity of infection and may include peripheral blood smear to detect extracellular parasites, polymerase chain reaction test, and enzyme-linked immunosorbent assay. Treatment involves prolonged courses of antiparasitic drugs, such as nifurtimox or benznidazole. Treatment of the chronic phase is supportive and oriented toward management of cardiac and gastrointestinal complications.

Incorrect Answers: A, B, C, and E.

Barrett esophagus (Choice A) is a state of premalignancy marked by intestinal metaplasia of the distal esophagus. Patients typically report a long-standing history of heartburn and may experience odynophagia. If untreated, Barrett esophagus may progress to esophageal cancer. Esophageal dilation does not occur in Barrett esophagus.

Nutcracker esophagus (Choice B), or hypertensive peristalsis, is a disorder of esophageal dysmotility that presents with dysphagia and intermittent chest pain. It does not lead to esophageal dilation.

Schatzki ring (Choice C) consists of a ring of redundant esophageal mucosal tissue that presents with dysphagia or chest pain if a bolus of food becomes lodged against the ring. Esophageal dilation does not typically occur.

Systemic sclerosis (scleroderma) (Choice E) presents with taut, hardened skin, Raynaud phenomenon, end-stage kidney disease, telangiectasias, cardiac fibrosis, esophageal dysmotility, and lower gastrointestinal tract fibrosis. Esophageal manifestations of scleroderma typically result in stricture, dysphagia, and dysmotility, but esophageal dilation does not typically occur.

Educational Objective: South American trypanosomiasis (Chagas disease) results from infection with *Trypanosoma cruzi*, acquired through the bites of Reduviidae insects. Chronic South American trypanosomiasis is incurable and characterized by cardiac manifestations including dilated cardiomyopathy, arrhythmia, and congestive heart failure, along with gastrointestinal manifestations such as constipation or megaesophagus, which can produce dysphagia, odynophagia, and weight loss.

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✓ 39. A hospitalized 27-year-old woman with sickle cell crisis has shortness of breath and nonproductive cough 4 hours after transfusion of 1 unit of packed red blood cells. Her only medication is morphine. Her temperature is 38°C (100.4°F), pulse is 126/min, respirations are 28/min, and blood pressure is 98/58 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Examination shows central cyanosis. Diffuse crackles are heard bilaterally. Heart sounds are normal. Arterial blood gas analysis on room air shows:

pH	7.47
Pco_2	38 mm Hg
Po_2	55 mm Hg

A chest x-ray shows bilateral pulmonary infiltrates. Which of the following is the most likely cause of these findings?

A) ABO incompatibility
B) Anaphylactic transfusion reaction
C) Fluid overload
D) Hemolytic transfusion reaction
E) Transfusion-related acute lung injury

Correct Answer: E.

Transfusion-related acute lung injury (TRALI) is a rare complication of blood product transfusion but a common cause of death related to transfusion. It commonly presents during or within 6 hours after a transfusion, with symptoms including fever, cyanosis, hypotension, and hypoxemia. Physical examination may disclose crackles on auscultation of the lungs. Chest x-rays will show new bilateral pulmonary infiltrates unrelated to cardiac dysfunction. The pathology is thought to be caused by activation of neutrophils in the pulmonary vasculature by antibodies in the transfused product, which leads to the release of cytokines and inflammatory mediators. Risk factors for its development include patient risk factors, such as tobacco use, fluid overload, shock, and alcohol use disorder. Platelets, plasma, and whole blood carry the greatest risk for causing TRALI. Treatment includes discontinuation of the transfusion, oxygen supplementation in the form of noninvasive positive pressure ventilation or intubation, and hemodynamic support.

Incorrect Answers: A, B, C, and D.

ABO incompatibility (Choice A) occurs when a patient receives an inappropriately typed and crossed transfusion product. This leads to acute hemolysis as the patient's antibodies attack the transfused red blood cells. It presents with fever, rigors, flank pain, hematuria, and hypotension. It does not cause hypoxemia or bilateral pulmonary infiltrates as in this patient.

Anaphylactic transfusion reaction (Choice B) is a rare IgE-mediated transfusion reaction most seen in patients with IgA deficiency or in patients who are allergic to substances used to store blood products. Symptoms include bronchospasm with associated dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. This patient has primarily respiratory symptoms, including hypoxia and bilateral pulmonary infiltrates, making TRALI a more likely cause of symptoms.

Fluid overload (Choice C) presents with peripheral and pulmonary edema, often after large volume fluid resuscitation. Pulmonary edema can cause dyspnea, hypoxemia, and bilateral pulmonary infiltrates on chest x-rays, as seen in this patient. However, it is less likely to cause fever and hypotension and would be unlikely to occur after only a single blood product transfusion.

Hemolytic transfusion reaction (Choice D) commonly occurs as a result of ABO incompatibility. It presents with fever, rigors, flank pain, hematuria, and hypotension. Laboratory evaluation may disclose

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C) Fluid overload
D) Hemolytic transfusion reaction
E) Transfusion-related acute lung injury

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Incorrect Answers: A, B, C, and D.

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Hemolytic transfusion reaction (Choice D) commonly occurs as a result of ABO incompatibility. It presents with fever, rigors, flank pain, hematuria, and hypotension. Laboratory evaluation may disclose acute kidney injury or signs of disseminated intravascular coagulation. It is less likely than TRALI to cause the hypoxemia or bilateral pulmonary infiltrates on chest x-ray, as seen in this patient.

Educational Objective: Transfusion-related acute lung injury is a rare complication of blood product transfusion that presents with fever, cyanosis, hypotension, hypoxemia, and new bilateral pulmonary infiltrates on chest x-rays. It is caused by activation of neutrophils in the pulmonary vasculature by antibodies in the transfused product, which leads to the release of inflammatory mediators. Treatment includes discontinuation of the transfusion, oxygen supplementation in the form of noninvasive positive pressure ventilation or intubation, and hemodynamic support.

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40. A 22-year-old man comes to the physician because of a severe nosebleed and a generalized rash for the past 24 hours. He has a 1-month history of fatigue and generalized weakness. His temperature is 36.7°C (98°F), pulse is 100/min, respirations are 18/min, and blood pressure is 142/72 mm Hg. Examination of the skin shows diffuse petechiae over the entire body. There is diffuse lymphadenopathy and mild hepatosplenomegaly. The nares are packed with gauze, and there is no active bleeding. Laboratory studies show:

Hematocrit	28%
Leukocyte count	36,000/mm^3
Segmented neutrophils	10%
Lymphocytes	25%
Lymphoblasts and other immature forms	65%
Platelet count	15,000/mm^3
Serum	
Urea nitrogen	20 mg/dL
Creatinine	1.2 mg/dL
Uric acid	15.2 mg/dL

A biopsy specimen of bone marrow shows acute lymphoblastic leukemia. In addition to vigorous hydration and alkalinization of the urine, which of the following is most appropriate to administer to prevent acute renal failure during chemotherapy in this patient?

A) Acetylcysteine
B) Allopurinol
C) Lisinopril
D) Low-dose dopamine
E) Mesna

Correct Answer: B.

Tumor lysis syndrome (TLS) commonly occurs following the initiation of chemotherapy for leukemia or lymphoma. The abrupt destruction of a large number of tumor cells results in interstitial and serum release of intracellular contents, manifesting as hyperphosphatemia, hypocalcemia, hyperkalemia, and hyperuricemia. Patients with TLS can present with fever, nausea, vomiting, diarrhea, lethargy, cardiac dysrhythmias, seizures, tetany, muscle cramps, or syncope, and are at risk for sudden death secondary to associated electrolyte and metabolic abnormalities. Purine nucleic acids are metabolized to hypoxanthine and xanthine, which are converted to uric acid by xanthine oxidase, resulting in hyperuricemia. Uric acid can crystallize in the renal tubules leading to nephropathy and acute kidney injury, or it can deposit into the joints, leading to arthralgias (eg, gout). Patients undergoing induction chemotherapy should be monitored for TLS and treated prophylactically with aggressive intravenous hydration along with allopurinol, a xanthine oxidase inhibitor, or rasburicase, a recombinant uric oxidase. Treatment of TLS involves supportive care and correction of electrolyte and metabolic abnormalities. Rasburicase is helpful in the treatment of TLS. In patients with severe kidney injury and refractory electrolyte derangements, renal replacement therapy with dialysis may be indicated.

Incorrect Answers: A, C, D, and E.

Acetylcysteine (Choice A) is useful for replenishing hepatic stores of the antioxidant glutathione and is commonly used in the setting of acetaminophen overdose. It is not helpful in TLS, which does not result in glutathione depletion

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Creatinine	1.2 mg/dL
Uric acid	15.2 mg/dL

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Incorrect Answers: A, C, D, and E.

Acetylcysteine (Choice A) is useful for replenishing hepatic stores of the antioxidant glutathione and is commonly used in the setting of acetaminophen overdose. It is not helpful in TLS, which does not result in glutathione depletion.

Lisinopril (Choice C) is an angiotensin-converting enzyme inhibitor and is useful for the treatment of hypertension. While hypertension may occur in the setting of acute kidney injury secondary to TLS, lisinopril plays no role in the routine prophylaxis of TLS.

Low-dose dopamine (Choice D) has been used historically for the prevention of acute kidney injury. Its use is not supported by high-quality evidence, and there is evidence that it may worsen renal perfusion.

Mesna (Choice E) is utilized to reduce the risk for hemorrhagic cystitis in patients taking cyclophosphamide. It plays no role in the prophylaxis of TLS.

Educational Objective: Patients undergoing initiation of chemotherapy for leukemia or lymphoma should be monitored for tumor lysis syndrome. Prophylaxis includes aggressive intravenous hydration and treatment with allopurinol or rasburicase.

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41. A 25-year-old man is brought to the emergency department by ambulance 25 minutes after his wife found him unconscious on the floor at home this morning. He was discharged from the military 3 months ago after he sustained a traumatic brain injury and underwent right below-the-knee amputation. Since his return, his family says he has had mood swings, aggressive behavior, and anxiety, which have prevented him from interacting with people. He has major depressive disorder and severe limb pain. His medications are amitriptyline, sertraline, oxycodone, and acetaminophen. Two days ago, he began a short-term course of alprazolam for persistent anxiety. His family says he generally has been adherent to his medication and cognitive behavioral therapy regimens. He does not smoke cigarettes. He drank four 12-oz beers weekly as a teenager; now he drinks eight 12-oz beers weekly. On arrival, he is somnolent and responds to painful stimuli only. Temperature is 36.7°C (98.0°F), pulse is 110/min, respirations are 10/min and shallow, and blood pressure is 85/60 mm Hg. Pulse oximetry on 4 L/min of oxygen by nasal cannula shows an oxygen saturation of 92%. Examination shows warm, dry, flushed skin. The pupils are mydriatic with nystagmus. Air movement is decreased in the lungs. Cardiac examination shows no abnormalities. The abdomen is soft. Bowel sounds are decreased. Patellar deep tendon reflexes are 3+ bilaterally. An overdose of which of the following is the most likely explanation for these findings?

A) Acetaminophen
B) Alcohol
C) Alprazolam
D) Amitriptyline
E) Oxycodone

Correct Answer: D.

This patient has likely attempted suicide by overdose with amitriptyline, a tricyclic antidepressant (TCA). TCA overdose presents with anticholinergic adverse effects (eg, hyperthermia, flushing, mydriasis, ileus, and urinary retention) and cardiac arrhythmias, generally wide QRS complex tachycardia. Neurologic manifestations include mental status changes, decreased level of consciousness, delirium, and seizures. Resuscitation can include intubation for patients not protecting the airway or with respiratory failure, the administration of sodium bicarbonate to treat cardiac toxicity, and the administration of intravenous fluids to correct hypotension. A dose of activated charcoal may be given to bind any remaining intraluminal drug but should only be used if the airway is protected. The mainstay of treatment for TCA overdose is sodium bicarbonate. A broad set of laboratory studies should be sent to assess for end-organ dysfunction and coingestion.

Incorrect Answers: A, B, C, and E.

Acetaminophen poisoning (Choice A) presents with nonspecific symptoms of fatigue, malaise, and abdominal pain followed by signs and symptoms of liver failure, including jaundice, altered mental status, and coagulopathy.

Alcohol (Choice B) is a central nervous system (CNS) depressant that, in toxic doses, can cause slurred speech, ataxia, emotional lability, and memory lapses. Similarly, alprazolam (Choice C) is a benzodiazepine medication, a CNS depressant with a toxidrome of slurred speech, ataxia, and altered mental status. While alcohol and benzodiazepines are CNS depressants causing sedation, they would not cause an anticholinergic toxidrome as seen in TCA toxicity.

Oxycodone (Choice E) is an opioid. Opioid intoxication causes euphoria, altered mental status, sedation, bradycardia, hypotension, depressed respiratory drive, and constricted pupils. Miosis often differentiates opioid intoxication from other CNS depressant toxidromes.

Educational Objective: Features of tricyclic antidepressant overdose include confusion, delirium, cardiac arrhythmias, hypotension, and anticholinergic toxicity (eg, ileus, urinary retention). Other neurologic manifestations can include increased deep tendon reflexes and seizures.

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✓ 42. A 29-year-old woman comes to the physician for a routine health maintenance examination. She has no history of serious illness and takes no medications. Menses occur at regular 28-day intervals, last 5 days, and are accompanied by mild cramps. Her last menstrual period was 3 weeks ago. She is sexually active and monogamous with one male partner. She has a copper IUD in place. Her blood pressure is 118/72 mm Hg. Physical examination shows no abnormalities. Pelvic examination shows an IUD string at the cervical os and a mildly tender right adnexal mass. Transvaginal ultrasonography shows a normal uterus and left adnexa and a 5-cm hemorrhagic cyst in the right adnexa. Which of the following is the most appropriate next step in management?

A) Ceftriaxone and doxycycline therapy
B) Oral contraceptive therapy
C) Ovarian cystectomy
D) Removal of the IUD
E) Repeat transvaginal ultrasonography in 6 weeks

Correct Answer: E.

The corpus luteum develops from the mature follicle after the egg has ovulated during the menstrual cycle. In some instances, the corpus luteum can form a cyst, which can remain asymptomatic or potentially rupture. While a cyst may remain asymptomatic and be found incidentally on physical examination, a ruptured corpus luteum cyst classically presents with unilateral pelvic or lower abdominal pain that is severe and sudden in onset, often after sexual intercourse or physical activity. Pelvic ultrasonography will show a complex cystic mass (if unruptured) or free fluid in the pelvis, which may include hemorrhagic components (hemoperitoneum). Corpus luteum cysts are generally managed with supportive treatment and surveillance. As this patient has an unruptured, stable cyst, the most appropriate next step in management is repeat transvaginal ultrasonography in 6 weeks to ensure its resolution.

Incorrect Answers: A, B, C, and D.

Ceftriaxone and doxycycline therapy (Choice A) may be used in the treatment of sexually transmitted infections or tubo-ovarian abscess, the latter of which commonly presents with fever, mucopurulent cervical discharge, and cervical or adnexal tenderness. It may result in tachycardia and hypotension if severe. However, ultrasonography would more commonly show a heterogeneous, multilocular mass rather than a hemorrhagic cyst.

Oral contraceptive therapy (Choice B) is not necessary in this patient. While oral contraceptives may decrease the risk for ovarian cyst development as they inhibit ovulatory cycles, this patient is mildly symptomatic and has had no previous corpus luteum cysts. As such, it is more appropriate to ensure resolution of the cyst in 6 weeks with ultrasonography.

Ovarian cystectomy (Choice C), or surgical removal of the cyst, can be performed for persistent or symptomatic cysts. However, proceeding with an invasive surgical procedure at this time would be premature, as this patient's cyst may resolve on its own.

Removal of the IUD (Choice D) is not necessary. Copper-containing IUDs are not associated with an increased risk for corpus luteum cysts.

Educational Objective: Corpus luteum cysts can develop from the mature follicle. While they commonly remain asymptomatic, they can rupture and cause unilateral pelvic or lower abdominal pain that is severe and sudden in onset. Transvaginal ultrasonography is often used to confirm the diagnosis. Asymptomatic, nonruptured cysts can undergo surveillance with follow-up imaging to ensure resolution.

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43. A 20-year-old primigravid woman at 28 weeks' gestation is brought to the emergency department after she was involved in a high-speed motor vehicle collision. She was the restrained front seat passenger. She has no history of serious illness. Her pregnancy had been uncomplicated. She has moderate neck and back pain and abdominal tenderness. She appears confused. Her temperature is 37°C (98.6°F), pulse is 120/min, respirations are 24/min, and blood pressure is 100/58 mm Hg. The fetal heart rate is 140–150/min. Examination shows multiple facial contusions. Laboratory studies show a hematocrit of 32%, leukocyte count of 9000/mm^3, and platelet count of 210,000/mm^3. In addition to continuous fetal monitoring, which of the following is the most appropriate next step in management?

A) CT scan of the head and neck
B) Administration of Rh_O (D) immune globulin
C) Terbutaline tocolysis
D) Cesarean delivery
E) Exploratory laparotomy

Correct Answer: A.

The initial evaluation of a critically ill patient includes assessing the airway, breathing, circulation, central nervous system, and any external threats to morbidity or mortality. After blunt head injury, patients can present with concussion or traumatic intracranial hemorrhage such as subdural hematoma, subarachnoid hemorrhage, or epidural hematoma. A young patient with altered mental status and signs of trauma to the head raises concern for traumatic intracranial hemorrhage. CT scan of the head is critical in the diagnosis and management of a patient with head trauma. CT scan of the neck is also indicated in patients with neck pain as well as altered mental status in a high-speed blunt traumatic injury. Although pregnant, the risk to the mother (and therefore fetus) is high, and benefits of radiation outweigh risks in such cases.

Incorrect Answers: B, C, D, and E.

Administration of Rh_O (D) immune globulin (Choice B) would be indicated in cases of any concern for fetomaternal hemorrhage in pregnant women who are Rh-antigen negative. Exposure to the Rh antigen can result in immunoglobulin formation and present risk for subsequent fetal hemolysis in future pregnancies if the fetus is Rh positive. It can be administered promptly but would not take priority over CT scan of the head and neck in this case.

Terbutaline tocolysis (Choice C) is indicated to help prevent premature labor. This patient does not have evidence of contractions, so tocolysis is not indicated.

Cesarean delivery (Choice D) would be indicated in pregnant patients with imminent or active cardiac arrest, with the goal to resuscitate the mother and improve fetal survival.

Exploratory laparotomy (Choice E) of the abdomen is indicated for hemodynamically unstable patients presenting after abdominal trauma, as it permits the control of hemorrhage and the repair of identified injuries. In stable cases, imaging precedes surgical intervention.

Educational Objective: After blunt head injury, patients can present with concussion or traumatic intracranial hemorrhage such as subdural hematoma, subarachnoid hemorrhage, or epidural hematoma. CT scan of the head and neck is critical in diagnosing traumatic intracranial and cervical spine injuries in patients with altered mental status.

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44. A 15-year-old boy is brought to the physician because of fatigue since starting his freshman year of high school 3 months ago. He often falls asleep during class. He urinates four to five times nightly and often has difficulty falling asleep again. He has no history of serious illness and takes no medications. He is at the 20th percentile for height and above the 95th percentile for weight and BMI. Vital signs are within normal limits. Examination shows a velvety, hyperpigmented macular rash over the neck and axillae. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hematocrit	39%
Leukocyte count	5900/mm^3
Platelet count	401,000/mm^3
Serum	
Na^+	133 mEq/L
K^+	4.3 mEq/L
Cl^-	98 mEq/L
HCO_3^-	22 mEq/L
Urea nitrogen	14 mg/dL
Glucose	148 mg/dL
Creatinine	0.6 mg/dL
Urine	
pH	5
Specific gravity	1.035
Glucose	2+
Ketones	negative

This patient is at increased risk for which of the following complications of his current condition during the next 15 years?

A) Adenocarcinoma of the bowel
B) Adrenal insufficiency
C) Coronary artery disease
D) Diabetes insipidus
E) Ruptured cervical disc

Correct Answer: C.

Type 2 diabetes mellitus can be asymptomatic or present with polydipsia, polyuria, acanthosis nigricans, and diabetic ketoacidosis or hyperosmolar hyperglycemic state, if severe. While there are several accepted diagnostic criteria, commonly employed criteria include a hemoglobin A1C greater than or equal to 6.5% or a fasting glucose concentration greater than or equal to 126 mg/dL. The Framingham Heart Study identified a roughly twofold increase in the rate of coronary artery disease (CAD) in patients with diabetes mellitus. Patients with diabetes mellitus are also at increased risk for extensive, multivessel CAD. In addition to diabetes mellitus, childhood or adolescent obesity is a risk factor for the premature development of CAD. Initial management for type 2 diabetes mellitus includes weight loss and lifestyle modifications, with the addition of oral antihyperglycemics if these modifications are unsuccessful. A multifactorial approach is necessary to reduce the risk for developing CAD by controlling hyperglycemia and other risk factors, such as obesity, hyperlipidemia, and hypertension.

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Incorrect Answers: A, B, D, and E.

Adenocarcinoma of the bowel (Choice A) is incorrect. While diabetes mellitus and obesity are associated with a higher incidence of nonalcoholic fatty liver disease, they are not associated with bowel adenocarcinoma.

Adrenal insufficiency (Choice B) is incorrect. Type 2 diabetes mellitus occurs as a result of increased peripheral insulin resistance. While diabetes mellitus may result in kidney dysfunction as a result of chronic microvascular injury, adrenal function is typically normal.

Diabetes insipidus (Choice D) is incorrect. This adolescent with obesity is more likely to have type 2 diabetes mellitus. Diabetes mellitus is not related to diabetes insipidus, which occurs as a result of impaired hypothalamic or pituitary production of vasopressin, or impaired renal responsiveness to vasopressin.

Ruptured cervical disc (Choice E) does not commonly occur in adolescents with diabetes mellitus or obesity. Obesity is associated with a higher incidence of slipped capital femoral epiphysis.

Educational Objective: Diabetes mellitus and childhood or adolescent obesity are significant risk factors for coronary artery disease (CAD). Diabetes mellitus is also a risk factor for multivessel CAD. A multifactorial approach is necessary to reduce the risk for developing CAD by controlling hyperglycemia and other risk factors, such as obesity, hyperlipidemia, and hypertension.

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45. A previously healthy 3-year-old boy who is scheduled for an elective operation begins to cry and cling tightly to his mother on arrival at the hospital. Which of the following is the most likely cause of this behavior?

A) Fear of mutilation
B) Fear of pain
C) Fear of separation from parent
D) Panic disorder
E) Stranger anxiety

Correct Answer: C.

Separation from a primary caregiver often leads to fear and distress in children, which is referred to as separation anxiety. Separation anxiety is common in young children, especially those between age 18 months and 3 years. Children around this age have not developed object permanence, or the idea that items out of their sight continue to exist. Separation anxiety can become even more apparent in unfamiliar situations, such as the healthcare system. This 3-year-old patient is approaching an unfamiliar location and is demonstrating crying and clinging, which are common symptoms of separation anxiety likely related to a fear of being separated from his mother.

Incorrect Answers: A, B, D, and E.

Fear of mutilation (Choice A) and fear of pain (Choice B) are fears related to receiving bodily harm. This patient, who was previously healthy and has no experience in the healthcare system, is unlikely to recognize that arriving at the hospital may be associated with pain caused by intravenous line placement or surgery itself. Therefore, fear of separation from his mother is more likely.

Panic disorder (Choice D) is a type of anxiety disorder occasionally seen in children. The primary presenting feature of panic disorder is the presence of panic attacks, which are episodes of intense anxiety associated with palpitations, tachypnea, diaphoresis, and an impending sense of doom. These attacks generally lead to avoidance behaviors to prevent further attacks in the future. This patient is experiencing normal separation anxiety in an unfamiliar situation.

Stranger anxiety (Choice E) is also common in children and manifests as fear and avoidance of strangers. It is more common in children from age 9 months to 2 years. This patient has not met any strangers yet in this scenario, making fear of separation from his mother the more likely cause of his presentation.

Educational Objective: Separation anxiety is common in children from age 18 months to 3 years. It often manifests with fear and distress, and it is associated with crying and clinging to the primary caregiver when faced with situations in which the caregiver may leave. This can be exacerbated in unfamiliar situations.

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46. A 19-year-old woman is brought to the emergency department by her mother 30 minutes after ingesting an unknown liquid she found in her parents' utility room following an argument with her boyfriend. Immediately after swallowing the liquid, she telephoned her mother at work, who arrived at home 20 minutes later and found her daughter drooling and reporting severe upper chest pain. On arrival at the emergency department, the patient is in obvious distress and is drooling and unable to swallow. Temperature is 37.0°C (98.6°F), pulse is 120/min and regular, respirations are 20/min, and blood pressure is 148/90 mm Hg. Physical examination shows profuse clear drainage from the mouth and erythema and edema of the posterior oropharynx. Cardiopulmonary examination shows no abnormalities. Two large-bore intravenous catheters are inserted for fluid administration and a dose of intravenous hydromorphone is administered. The patient begins to feel more comfortable. Results of laboratory studies are within the reference ranges. Chest x-ray shows no abnormalities. Which of the following is the most appropriate management?

A) Administration of activated charcoal
B) Administration of oral bicarbonate
C) Esophagogastroduodenoscopy
D) Induction of vomiting
E) Nasogastric tube placement

Correct Answer: C.

This patient, presenting after an acute ingestion, likely ingested a caustic household chemical. Drain cleaners are a common cause of caustic ingestions. They contain hydroxides, alkali that are proton acceptors and strong nucleophiles. Alkali ingestion leads to liquefactive necrosis, lactic acidosis, and tissue penetration and ulceration. It can cause chemical burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and drooling. If severe, esophageal perforation can result, leading to leakage of gastrointestinal contents into the mediastinum. Treatment is initially focused on supportive measures, including airway management and fluid resuscitation. Visible lesions in the oropharynx increase the likelihood of distal gastrointestinal lesions. Patients should be evaluated with esophagogastroduodenoscopy (EGD) to assess for visceral injury. For severe injuries, treatment involves corticosteroid administration, antibiotics, and potentially surgical intervention in cases of perforation.

Incorrect Answers: A, B, D, and E.

Administration of activated charcoal (Choice A) would not be safe for a patient who is drooling, unable to swallow, and has limited ability to protect the airway. Charcoal, if aspirated, can be harmful to the pulmonary parenchyma and cause aspiration pneumonitis. Activated charcoal can also obscure the results of EGD.

Administration of oral bicarbonate (Choice B) would not be safe for a patient who is unable to swallow and is generally inappropriate management of any acid/base ingestion as it can cause additional exothermic reactions via acid-base neutralization, which can lead to further injury.

Induction of vomiting (Choice D) would cause further harm to this patient's esophagus by inducing trauma and increased pressure. It can also cause further exposure of caustic alkali to esophageal mucosa and worsen damage.

Nasogastric tube placement (Choice E) should also be avoided as it can cause further trauma to any existing esophageal injury. Patients with caustic alkali injury can have esophageal perforation, and the introduction of a blind nasogastric tube can create a false passage or lumen.

Educational Objective: Caustic household chemicals such as rain cleaners contain caustic alkali that can cause burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and drooling. Esophagogastroduodenoscopy is most appropriate to evaluate the extent of mucosal injury.

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47. A 23-year-old male college student comes to the clinic for a follow-up visit 14 days after undergoing emergent splenectomy following a motor vehicle collision. The patient has resumed his regular diet and is ambulating normally. Medical history otherwise is unremarkable, and his only medication is acetaminophen as needed. The patient completed his *Haemophilus influenzae* type b vaccinations by age 18 months and his varicella, polio, and measles-mumps-rubella vaccinations by age 5 years; he received a human papillomavirus vaccination at age 11 years. Temperature is 37.0°C (98.6°F), pulse is 82/min, and blood pressure is 116/54 mm Hg. Abdominal examination shows a well-healing midline incision. Which of the following vaccinations is most appropriate to administer to this patient today?

A) *Haemophilus influenzae* type b
B) Human papillomavirus
C) Inactivated poliovirus
D) Measles, mumps, rubella
E) Varicella
F) No vaccine is indicated at this time

Correct Answer: A.

Asplenia can occur because of congenital anomalies, splenectomy after trauma, or because of chronic vasoocclusion and infarction in conditions such as sickle cell disease. The spleen removes opsonized pathogens and infected cells by mechanical filtration in the sinusoids and by phagocytosis by splenic macrophages. Additionally, the spleen houses immunoglobulin-producing B lymphocytes. The spleen plays an important role in the clearance of encapsulated pathogens such as *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*, among others. Asplenic patients are at risk for infection with encapsulated bacteria, making vaccination against encapsulated bacteria, such as *Haemophilus influenzae*, the most appropriate for this patient.

Incorrect Answers: B, C, D, E, and F.

Viral infection risk from human papillomavirus (Choice B), inactivated poliovirus (Choice C), measles, mumps, rubella (Choice D), and varicella (Choice E) is not necessarily increased after splenectomy.

No vaccine (Choice F) would be harmful as patients with asplenia are at increased risk for infection for encapsulated bacteria.

Educational Objective: Splenectomy increases the risk for infection with encapsulated organisms such as *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*. Patients with impaired splenic function require pneumococcal, *Haemophilus influenzae*, and meningococcal vaccines.

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48. A previously healthy 19-year-old college student comes to the emergency department because of a 3-day history of lower abdominal pain and vaginal spotting. Menses usually occur at regular 28-day intervals, but she cannot recall the date of her last menstrual period. She takes no medications. She is sexually active and uses condoms inconsistently. She appears pale but is alert and answers questions appropriately. Her pulse is 110/min, respirations are 22/min, and blood pressure is 80/50 mm Hg. Abdominal examination shows lower quadrant tenderness with marked guarding. Pelvic examination shows a soft uterus and adnexal tenderness greater on the right than on the left. Her hemoglobin concentration is 6.2 g/dL, hematocrit is 18%, and serum β-hCG concentration is 6645 mIU/mL. Urinalysis shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Observation only
B) CT scan of the abdomen
C) Intravenous antibiotic therapy
D) Culdocentesis
E) Exploratory laparotomy

Correct Answer: E.

Pregnancy is suspected when there is a missed or delayed menstrual period. An ectopic pregnancy is an abnormal pregnancy in which the fertilized ovum implants in the fallopian tube, which is most common, on the ovary, within the peritoneal cavity, or in any nonendometrial location. It often presents with vaginal bleeding and abdominopelvic pain. β-hCG concentrations will be detectable, and the pregnancy may be visible on ultrasonography. Ectopic pregnancies are nonviable. Small, early pregnancies can be managed medically with methotrexate. A rare complication of an unrecognized ectopic pregnancy is rupture, leading to bleeding and hemoperitoneum. In this instance, physical examination may show abdominal guarding. Severe cases may lead to hemorrhagic shock with tachycardia, hypotension, and anemia, as seen in this patient. Treatment of a ruptured ectopic pregnancy is emergent exploratory laparotomy along with fluid and blood product resuscitation.

Incorrect Answers: A, B, C, and D.

Observation only (Choice A) would be inappropriate, as this patient is experiencing hemorrhagic shock from intraperitoneal bleeding. Failure to control the bleeding with exploratory laparotomy will result in ongoing hemorrhage, shock, and eventual death.

CT scan of the abdomen (Choice B) is not the most appropriate next step in management. While it may show the ruptured ectopic pregnancy, this patient is hemodynamically unstable and requires emergent surgical evaluation. Obtaining a CT scan of the abdomen would delay the time to the operating room, resulting in an increased risk for morbidity and mortality.

Intravenous antibiotic therapy (Choice C) could be considered if there was concern for a tubo-ovarian abscess, which commonly presents with fever, mucopurulent cervical discharge, and cervical or adnexal tenderness. It may result in tachycardia and hypotension if severe but would not explain this patient's severe anemia.

Culdocentesis (Choice D) is a rarely performed procedure in which fluid is aspirated from the posterior cul-de-sac, often in the evaluation of lower abdominal pain. In the event of a ruptured ectopic pregnancy, it would be expected to disclose bloody fluid. However, performing culdocentesis in a patient with a hemodynamically unstable ruptured ectopic pregnancy would be less appropriate than taking the patient for emergent exploratory laparotomy to control the bleeding.

Educational Objective: An ectopic pregnancy is an abnormal pregnancy in which the fertilized ovum implants in the fallopian tube, which is most common, on the ovary, within the peritoneal cavity, or in any nonendometrial location. It often presents with vaginal bleeding and abdominopelvic pain. A rare complication of an unrecognized ectopic pregnancy is rupture, leading to hemoperitoneum, with severe cases causing hemorrhagic shock. Treatment of a ruptured ectopic pregnancy is emergent exploratory laparotomy.

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49. A 17-year-old boy is brought to the office by his parents because of changes in his behavior during the past 6 months. They say he has become withdrawn and moody and that his grades have declined. He has returned home from parties intoxicated three times during the past month. During a wedding reception 3 weeks ago, he was delirious, incoherent, and imbalanced. The patient says he drinks alcohol but that his drinking is not a problem and he can stop drinking whenever he wants. Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, he is calm and cooperative. He reports no insomnia, hypersomnia, or suicidal ideation. Which of the following is the most likely diagnosis?

A) Alcohol use disorder
B) Conduct disorder
C) Major depressive disorder
D) Normal adolescent behavior
E) Recreational alcohol use

Correct Answer: A.

Alcohol use disorder refers to an addiction to alcohol that must meet at least two of the following criteria: an inability to cut back on drinking, drinking more than expected, excessive time spent drinking, alcohol cravings, persistent drinking despite physical or mental problems related to drinking, and persistent drinking despite negative social consequences. Alcohol use disorder is a clinical diagnosis made by the presence of personal, professional, social, emotional, behavioral, and physical disturbances related to the use of alcohol or attempts to reduce intake. Symptoms may be classified as mild, moderate, or severe depending on the number of domains affected. Alcohol use disorder can occur in adolescents and is associated with negative social and academic consequences as well as increased risk for high-risk sexual behavior, accidental death, and suicide.

Incorrect Answers: B, C, D, and E.

Conduct disorder (Choice B) refers to persistent, repetitive, and pervasive patterns of violating major societal norms, rules, and basic rights of others. While the patient's excessive drinking can be viewed as violating a societal norm, this patient does not display evidence of violating the rights of others, such as violence, dishonesty, destruction of property, or theft.

Major depressive disorder (Choice C) includes 2 or more weeks of five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in socializing), guilt or worthlessness, difficulty concentrating, psychomotor retardation, suicidal thoughts, and/or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance).

Normal adolescent behavior (Choice D) involves a heightened degree of risk taking. Experimentation with alcohol is common among adolescents. However, this patient displays evidence of a more pervasive pattern of alcohol use with associated negative social and academic consequences, indicating alcohol use disorder.

Recreational alcohol use (Choice E) is distinguished from alcohol use disorder by moderate use and absence of dependence and negative consequences associated with drinking. Recreational alcohol use as an adolescent is not legal in the United States.

Educational Objective: Alcohol use disorder is characterized by an inability to cut back on drinking, excessive time spent drinking, and negative consequences related to drinking. Alcohol use disorder can occur in adolescents and is associated with negative social and academic consequences as well as increased risk for high-risk sexual behavior, accidental death, and suicide.

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50. A 47-year-old woman comes to the physician because of a 9-month history of hot flashes, night sweats, and pain during sexual intercourse. Her last menstrual period was 1 year ago. Physical examination shows no abnormalities. Pelvic examination shows vaginal atrophy and no cervical mucus. A Pap smear and mammography show no abnormalities. Which of the following is the most appropriate next step in management?

A) Pregnancy test
B) Measurement of serum luteinizing hormone concentration
C) Hormone therapy
D) Levothyroxine therapy
E) Vaginal corticosteroid therapy

Correct Answer: C.

Menopause refers to the absence of menstruation for 1 year caused by a diminution in ovarian reserve. On average, it begins around age 50 years. Symptoms include hot flashes, night sweats, and vaginal atrophy or dryness. Mood and sleeping patterns may be affected. While it is commonly a clinical diagnosis, laboratory studies will show increased follicle-stimulating hormone and decreased estradiol concentrations. As symptoms of menopause are secondary to estrogen deficiency, which can also increase the risk for a variety of other health problems (eg, osteoporosis), hormone therapy with supplemental estrogen is often considered. While estrogen therapy does relieve symptoms, it is not without risk. Prolonged exposure to unopposed estrogen can increase the risk for endometrial cancer, cardiovascular disease, thromboembolism, and breast cancer. The recommended duration of use is limited to 3 to 5 years for these reasons.

Incorrect Answers: A, B, D, and E.

Pregnancy test (Choice A) is not necessary. This patient has not had a menstrual period in more than 1 year, making pregnancy unlikely, and is experiencing symptoms indicative of menopause.

Measurement of serum luteinizing hormone concentration (Choice B) can be used if the diagnosis of menopause is unclear, as it and follicle-stimulating hormone will be increased in the absence of negative feedback from estradiol. However, menopause is primarily a clinical diagnosis.

Levothyroxine therapy (Choice D) is used in the treatment of hypothyroidism, which commonly presents with weight gain, lethargy, fatigue, constipation, hair loss, and cold intolerance. It may also result in amenorrhea or oligomenorrhea. This patient's symptoms are limited to amenorrhea, hot flashes, and vaginal atrophy, making menopause a more likely diagnosis.

Vaginal corticosteroid therapy (Choice E) may be used in the treatment of lichen planus or lichen sclerosis. While this patient has symptoms of vaginal atrophy, this is most likely caused by estrogen deficiency. Her symptoms would therefore be better treated with topical or systemic estrogen supplementation.

Educational Objective: Menopause commonly occurs at approximately age 50 years with hot flashes, night sweats, and vaginal atrophy or dryness. As symptoms of menopause are secondary to estrogen deficiency, hormone therapy with supplemental estrogen is often considered. Estrogen therapy can increase the risk for endometrial cancer, cardiovascular disease, thromboembolism, and breast cancer. Thus, its use should be limited to patients at low risk for these diseases. Additionally, its use is only recommended for 3 to 5 years.

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✓ 1. A 67-year-old woman comes to the physician because of a 2-month history of perirectal pain that worsens with bowel movements and a thick, yellow rectal discharge. She has hypertension and psoriasis. Her medications are metoprolol and topical fluocinolone cream. There is no family history of serious illness. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 14/min, and blood pressure is 136/70 mm Hg. The abdomen is soft, nontender, and nondistended. Rectal examination shows brown stool. The skin of the posterior perineal wall is erythematous with a draining sinus tract. Test of the stool for occult blood is positive. Which of the following is the most likely diagnosis?

A) *Clostridium difficile* colitis
B) Colon cancer
C) Crohn disease
D) Diverticular abscess
E) Ulcerative colitis

Correct Answer: C.

Crohn disease is characterized by transmural inflammation of the gastrointestinal tract, most frequently involving the terminal ileum. It can arise anywhere in the gastrointestinal tract and is a subclass of inflammatory bowel disease. Most patients experience chronic abdominal cramping, bloody diarrhea, and weight loss. Examination often discloses generalized abdominal tenderness, sometimes worse in the right lower quadrant, and, depending on the severity and extent, may disclose complications such as enterocutaneous fistulas and extraintestinal manifestations such as uveitis. Severe Crohn disease can result in intestinal obstruction from stricture or inflammation, bowel perforation, intra-abdominal abscesses, and the formation of fistulas. Diagnosis occurs through imaging and biopsy. Laboratory studies often show increased erythrocyte sedimentation rate and c-reactive protein. On fluoroscopic small bowel follow-through, narrowing of the intestinal lumen at the terminal ileum is commonly seen along with other sites of strictures or fistulous formation. Treatment includes anti-inflammatory medications, immunomodulators, and glucocorticoids. Complicated, severe cases may require surgery, including small bowel resection or colectomy.

Incorrect Answers: A, B, D, and E.

Clostridium difficile colitis (Choice A) can present as pseudomembranous colitis. On colonoscopy, yellow pseudomembranes are seen amid inflamed, ulcerated colonic mucosa. However, formation of draining sinus tracts or fistulas does not occur.

Colon cancer (Choice B) may present with painless gastrointestinal bleeding but does not commonly form enterocutaneous fistulas.

Diverticular abscess (Choice D) presents with fever, left lower quadrant abdominal pain, diarrhea, tenderness to palpation, and leukocytosis. Abscesses can exist along with other complications, such as perforation, peritonitis, and sepsis. Draining cutaneous tracts are not common sequelae.

Ulcerative colitis (Choice E) is a type of inflammatory bowel disease that results in mucosal and submucosal ulceration and inflammation that progresses retrograde along the colon from the rectum. This typically presents with chronic bloody diarrhea, tenesmus, and abdominal pain. In contrast to Crohn disease, transmural inflammation and associated sequelae, including bowel perforation, intra-abdominal abscesses, and fistulas, are less common.

Educational Objective: Crohn disease is characterized by transmural inflammation of the gastrointestinal tract and presents with chronic abdominal cramping, bloody diarrhea, and weight loss. Severe Crohn disease can result in intestinal obstruction from stricture or inflammation, bowel perforation, intra-abdominal abscesses, and the formation of fistulas.

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2. Twelve hours after discharge from the hospital, a 2-day-old male newborn is brought to the emergency department after having a seizure. His parents report that he stiffened, and his eyes rolled back for 3 or 4 minutes; then he went limp. He was delivered vaginally at term to a 20-year-old woman, gravida 1, para 1, following an uncomplicated pregnancy; his weight on delivery was 3062 g (6 lb 12 oz). The patient's mother used to drink two glasses of wine each evening with dinner but stopped drinking alcohol when she learned she was pregnant at 4 weeks' gestation. She has never smoked cigarettes or used illicit drugs. On arrival, the infant is awake but sluggish. Examination shows hypertelorism and low-set ears. The lungs are clear to auscultation. There are no murmurs. A chest x-ray shows a narrow mediastinum and a right-sided aortic arch. Which of the following is the most likely diagnosis?

A) Down syndrome
B) Severe combined immunodeficiency
C) Thymic-parathyroid dysplasia
D) Trisomy 13 syndrome
E) Wiskott-Aldrich syndrome

Correct Answer: C.

Thymic-parathyroid dysplasia (DiGeorge syndrome) is a disorder caused by a microdeletion in the 22q11.2 chromosome, which results in abnormal development of the third and fourth pharyngeal pouches. It presents early in childhood with thymic hypoplasia and impaired immunity, conotruncal cardiac defects (eg, truncus arteriosus), hypocalcemia caused by parathyroid hypoplasia, and craniofacial abnormalities, such as low-set ears, hypertelorism, micrognathia, and cleft lip and palate. It is associated with developmental delay. Severe hypocalcemia can lead to seizures, as in this patient, as well as laryngospasm, bronchospasm, and emesis. Laboratory evaluation will show leukopenia and low calcium concentrations, while a chest x-ray may show the absence of a thymic shadow, as well as a narrow mediastinum and right-sided aortic arch, as in this patient. Further evaluation typically includes an echocardiography and renal ultrasonography. Treatment is supportive and calcium repletion is critical, especially in cases of seizures.

Incorrect Answers: A, B, D and E.

Down syndrome (Choice A) results from trisomy of chromosome 21 and presents with characteristic physical features including broad, flat, facial features with prominent epicanthal folds, and a single palmar crease. Hypocalcemia and seizure are not common features of Down syndrome.

Severe combined immunodeficiency (Choice B) results from a variety of different mutations and commonly presents with recurrent bacterial, viral, and fungal infections caused by severe impairment in both B- and T-lymphocyte function in infancy. It is not associated with parathyroid dysplasia or hypocalcemia.

Trisomy 13 syndrome (Choice D) presents with characteristic features including intellectual disability, cleft lip and palate, holoprosencephaly, microphthalmia, cutis aplasia, feet with a prominent calcaneus and convexly rounded soles, and polydactyly.

Wiskott-Aldrich syndrome (Choice E) is caused by a mutation in the *WAS* gene on the X chromosome that encodes a protein essential for actin cytoskeleton rearrangement that occurs during interactions between T lymphocytes, antigen-presenting cells, and B lymphocytes, leading to an impaired innate and adaptive immune system. Patients present with eczema, thrombocytopenia, and infections with encapsulated bacteria and opportunistic pathogens. Hypocalcemia and seizure are not common features of this syndrome.

Educational Objective: Thymic-parathyroid dysplasia (DiGeorge syndrome), can lead to acute hypocalcemia and can present with seizures. Characteristic findings include signs of improper development of the third and fourth pharyngeal pouches, including low-set ears, hypertelorism, micrognathia, cleft lip and palate, thymic hypoplasia with impaired immunity, and parathyroid hypoplasia with associated hypocalcemia.

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✓ 3. A 2-year-old girl is brought to the physician for a well-child examination. She has had two urinary tract infections since birth. She has not had pain with urination or urinary frequency or urgency. Examination shows no abnormalities. Renal ultrasonography shows no obstruction. Voiding cystourethrography shows grade II vesicoureteral reflux. Which of the following is the most appropriate initial step to prevent future urinary tract infections in this patient?

A) Monitor temperature curves daily
B) Urine cultures weekly
C) Oral antibiotic prophylaxis
D) 2-Week course of intravenous antibiotic therapy
E) Vesicoureteral reimplantation

Correct Answer: C.

Recurrent urinary tract infections (UTIs) in children increases the risk for renal scarring, hydronephrosis, and chronic kidney disease. Vesicoureteral reflux (VUR) is characterized by incomplete closure of the vesicoureteral junction during voiding with retrograde flow of urine from the bladder to the ureters. VUR allows for retrograde transport of bacteria to the upper urinary tract and is a significant risk factor for pyelonephritis. The diagnosis is established by voiding cystourethrography (VCUG), which involves instillation of contrast dye into the bladder via catheterization and allows for visualization of reflux during voiding. Oral antibiotic prophylaxis is indicated for children with VUR who present with more than one UTI. Surgical repair of VUR may be warranted for children with recurrent UTIs despite oral antibiotic prophylaxis.

Incorrect Answers: A, B, D, and E.

Monitoring temperature curves daily (Choice A) and urine cultures weekly (Choice B) may allow for the early detection of recurrent UTIs but are not helpful for preventing recurrent infection.

2-Week course of intravenous antibiotic therapy (Choice D) is not able to provide sufficient long-term antimicrobial suppression. Long-term oral antibiotic prophylaxis is more effective in preventing recurrent UTI.

Vesicoureteral reimplantation (Choice E) may provide definitive repair of VUR but is typically performed after failure of oral antibiotic prophylaxis.

Educational Objective: Oral antibiotic prophylaxis is indicated for children with vesicoureteral reflux (VUR) who present with more than one urinary tract infection (UTI). Surgical repair of VUR may be warranted for children with recurrent UTIs despite oral antibiotic prophylaxis.

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4. A 4-year-old boy is brought to the physician by his mother because she is concerned that he is having difficulty making friends. The mother reports that he attends preschool but does not socialize with the other children and spends most of the time playing by himself. At school, he is only interested in blocks, reports how tall he can build towers, and resists other activities. At home, he spends hours building towers out of blocks in his room and becomes very upset if he is interrupted. He does not talk about any of his classmates; when his mother invites another child to the house, he has little interest in socializing. His mother reports that he understands directions and communicates without difficulty but has never been very affectionate. He is generally well behaved but will have a temper tantrum if a daily routine is altered or if furniture is rearranged. Pregnancy, labor, and delivery were uncomplicated, and he has reached all appropriate motor milestones for his age. His mother does not recall if language emerged somewhat later in him than it did for her daughter but notes that he makes his needs and wants known without any problem. He is neatly dressed. Physical examination shows no abnormalities. On mental status examination, he makes no eye contact with the physician and perseverates about the towers that he built in the waiting room. Which of the following is the most likely diagnosis?

A) Attention-deficit/hyperactivity disorder
B) Expressive language disorder
C) Obsessive-compulsive disorder
D) Pervasive developmental disorder
E) Social anxiety disorder (social phobia)

Correct Answer: D.

Autism spectrum disorder, also known as pervasive developmental disorder, is a neurodevelopmental disorder characterized by a broad range of signs and symptoms involving restricted and repetitive patterns of behavior or activities, difficulties with social interaction, and difficulties with communication. Children with autism often display a lack of interest in socializing, failure in empathy, and challenging behavior. Children may also display a restricted range of interests, excessive concern with routine, and resistance to change. The clinical manifestations of autism spectrum disorder typically present by age 2 years with delay or regression of communication and/or social skills. Impaired social cognition includes impaired nonverbal communication, such as eye contact and facial expressions. Management of autism spectrum disorder is individualized depending on the clinical manifestations and degree of impairment of the patient. Therapy involves behavioral, developmental, social, and educational interventions to improve social functioning, communication skills, and academic functioning.

Incorrect Answers: A, B, C, and E.

Attention-deficit/hyperactivity disorder (Choice A) is defined as a pattern of inattention and/or hyperactivity that persists in at least two settings. Patients may show symptoms of inattention (such as difficulty following instructions or completing tasks) or a poor attention span in school. Interrupting others, fidgeting, and not waiting one's turn may be symptoms of hyperactivity.

Expressive language disorder (Choice B) is characterized by impairment in spoken and/or written expressive language capabilities without an impairment in language comprehension. Lack of interest in others and excessive concerns with a routine are not features of expressive language disorder.

Obsessive-compulsive disorder (Choice C) manifests with recurrent, intrusive urges or thoughts (obsessions) that the patient tries to relieve or neutralize by repetitive rituals (compulsions). Common symptom complexes revolve around cleanliness, symmetry, harm to self or others, taboo thoughts or ideas, and completeness. Symptoms are time-consuming, cause significant distress, and markedly impair functioning.

Social anxiety disorder (social phobia) (Choice E) refers to an excessive fear of scrutiny, embarrassment, or rejection in social and/or performance situations leading to significant distress and/or impaired

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recall if language emerged somewhat later in him than it did for her daughter but notes that he makes his needs and wants known without any problem. He is neatly dressed. Physical examination shows no abnormalities. On mental status examination, he makes no eye contact with the physician and perseverates about the towers that he built in the waiting room. Which of the following is the most likely diagnosis?

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D) Pervasive developmental disorder
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Social anxiety disorder (social phobia) (Choice E) refers to an excessive fear of scrutiny, embarrassment, or rejection in social and/or performance situations leading to significant distress and/or impaired functioning.

Educational Objective: Autism spectrum disorder, also known as pervasive developmental disorder, presents with delayed or regressing communication and/or social skills, lack of interest in socializing, a restricted range of interests, and excessive concern with routine.

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5. Two days after undergoing urgent cesarean delivery because of a nonreassuring fetal heart tracing, a 37-year-old woman, gravida 1, para 1, has the onset of dysphoria, insomnia, and easy distractibility. Pregnancy was uncomplicated. She has no history of serious illness, and her only medication is a prenatal vitamin. Her paternal cousin had major depressive disorder, postpartum onset. The patient's vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 97%. Physical examination shows no abnormalities. On mental status examination, she has an irritable mood and tired, concerned affect. Without treatment, which of the following is most likely to develop in this patient?

A) Alopecia
B) Dissociative amnesia with dissociative fugue
C) Loss of maternal bond with newborn
D) Resolution of symptoms within 2 weeks
E) Suicidality

Correct Answer: D.

Postpartum blues are common after delivery and often represent hormonal changes as the patient returns to her prepregnancy state. It typically presents in the first few days after delivery with depressive symptoms such as dysphoria, anhedonia, irritability, insomnia, and decreased concentration that do not interfere with the patient's ability to care for the newborn or herself. These symptoms often self-resolve within 2 weeks of onset, which is what would be expected in this patient. Risk factors for development include a history depression, cesarean delivery, and lack of breast-feeding. Postpartum blues differ from major depressive disorder with peripartum onset in severity of symptoms, duration of symptoms, and effect on day-to-day functioning. Major depressive disorder with peripartum onset is associated with suicidality and should be treated with psychotherapy and antidepressant medications, whereas postpartum blues generally self-resolve within a few weeks and do not significantly impair functioning.

Incorrect Answers: A, B, C, and E.

Alopecia (Choice A) presents with hair loss that can be localized or diffuse, depending on the underlying cause. Postpartum alopecia may occur after delivery in some patients, but more commonly presents 2 to 4 months after delivery. Additionally, it is not associated with the depressive symptoms.

Dissociative amnesia with dissociative fugue (Choice B) refers to a complete loss of memory associated with wandering behavior. This pattern of behavior may be seen in dissociative identity disorder or may be caused by a recent traumatic exposure. Postpartum blues do not generally lead to dissociative amnesia or dissociative fugues.

Loss of maternal bond with newborn (Choice C) is unlikely with postpartum blues. A hallmark of postpartum blues, in contrast to major depressive disorder with peripartum onset, is mild depressive symptoms that do not affect the patient's ability to care for the newborn or herself. Postpartum blues also last for less than 2 weeks, making it unlikely that her symptoms will affect her bond with the newborn.

Suicidality (Choice E) is not present with postpartum blues. If suicidality does occur, further evaluation for major depressive disorder with peripartum onset or other psychiatric illnesses should occur. Patients with suicidality should undergo emergent evaluation and treatment.

Educational Objective: Postpartum blues are common after delivery, typically presenting in the first few days with depressive symptoms such as dysphoria, anhedonia, irritability, insomnia, and decreased concentration. These symptoms do not interfere with the patient's ability to care for the newborn or herself. These symptoms often self-resolve within 2 weeks of onset, in contrast to major depressive disorder with peripartum onset, in which symptoms are more severe and long-lasting.

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6. A 32-year-old woman with asthma comes to the physician because of a 3-month history of progressive wheezing and a cough that is occasionally productive of plugs of brownish sputum. She received the diagnosis of asthma 15 years ago. She has been taking an inhaled long-acting β-adrenergic agonist and inhaled glucocorticoid daily for 8 years and had good control of her symptoms until 3 months ago. She has no pets. She has no recent history of travel abroad or new occupational exposure. She appears well and is not in respiratory distress. Vital signs are within normal limits. Pulse oximetry on room air shows an oxygen saturation of 96%. Examination shows no cyanosis. Scattered inspiratory and expiratory wheezes are heard. There is no clubbing or peripheral edema. Her leukocyte count is 20,000/mm^3 (45% segmented neutrophils, 40% eosinophils, 12% lymphocytes, and 3% monocytes). Her serum IgE concentration is 2800 IU/mL. A chest x-ray shows alveolar infiltrates in the upper lungs bilaterally. Which of the following is the most likely diagnosis?

A) Allergic bronchopulmonary aspergillosis
B) Eosinophilic leukemia
C) Hypereosinophilic syndrome
D) Polyarteritis nodosa
E) *Strongyloides stercoralis* infection

Correct Answer: A.

Patients with asthma or cystic fibrosis are at increased risk for developing allergic bronchopulmonary aspergillosis, which is a hypersensitivity reaction caused by the presence of *Aspergillus fumigatus* organisms in the airways. The clinical syndrome is associated with transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis. Patients typically present with constitutional symptoms, including generalized fatigue and mild fever, progressive cough, and asthma-like symptoms that are refractory to treatment. Brown or black sputum and hemoptysis may be noted. Laboratory studies are notable for eosinophilia and increased serum IgE concentrations. CT scan of the chest is the gold standard for diagnosis and is characterized by central bronchiectasis and signs of mucoid impaction. Treatment consists of systemic corticosteroids, antifungal agents, and anti-IgE immunologics depending on the severity and chronicity of the syndrome.

Incorrect Answers: B, C, D, and E.

Hypereosinophilic syndrome (HES) (Choice C) is a heterogenous group of disorders characterized by peripheral eosinophilia (eosinophil count greater than 500/mm^3). Primary HES is caused by neoplastic clonal proliferation as in eosinophilic leukemia (Choice B), while secondary HES is reactive to another process. Parasitic and fungal infections are common causes of secondary HES, as is likely in this case.

Polyarteritis nodosa (Choice D) is a necrotizing vasculitis involving medium-sized arteries that generally affects the kidneys and visceral organs, sparing the lungs. It typically presents with fever, headache, malaise, weight loss, and abdominal pain.

Strongyloides stercoralis infection (Choice E) is caused by an intestinal roundworm and is a common cause of peripheral eosinophilia in patients from endemic regions. It has characteristic intestinal and pulmonary phases; the pulmonary phase is associated with transient infiltrates on chest imaging. A patient with a history of asthma living in a nonendemic region is more likely to have allergic bronchopulmonary aspergillosis.

Educational Objective: Allergic bronchopulmonary aspergillosis is a hypersensitivity reaction caused by *Aspergillus fumigatus*, and patients with asthma or cystic fibrosis are at increased risk. Patients present with chronic cough that may be productive of dark-colored sputum and hemoptysis. Characteristic findings include transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis.

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7. A 24-year-old woman comes to the office for an annual employment physical examination. She feels well. Medical history is unremarkable and she takes no medications. Vital signs are within normal limits. Physical examination discloses no abnormalities. As the physician is preparing to leave the examination room the patient asks, "Do you think having a romantic relationship with my gynecologist is all right?" Which of the following is the most appropriate response?

A) "I am under no obligation to report any romantic relationship to a disciplinary board."

B) "If you switch gynecologists it would be acceptable for your former gynecologist to begin a romantic relationship with you immediately."

C) "A mutually consensual romantic relationship between patient and physician can sometimes be justified."

D) "A romantic relationship in this setting is always unethical."

E) "Would you mind telling me who your gynecologist is?"

Correct Answer: D.

The relationship between physician and patient is asymmetrical in terms of the authority and trust invested in the physician, and a romantic relationship within this context exploits the vulnerability of the patient. Such relationships are particularly inappropriate when the nature of the physician-patient interaction is intimate, such as in obstetrics and gynecology or psychiatry. The American College of Obstetricians and Gynecologists (ACOG) guidelines state that sexual or romantic relationships between a gynecologist and a current patient are always unethical and may be grounds for investigation or criminal prosecution. The American Medical Association's Code of Ethics suggests that physicians completely terminate the physician-patient relationship before pursuing a romantic relationship. However, romantic relationships subsequent to the physician-patient relationship may be influenced by the prior relationship, creating further ethical dilemmas. This patient who is inquiring about dating her gynecologist raises a concern for possible sexual misconduct. The patient should be informed that such a relationship is inappropriate. A discussion inquiring about what the patient has experienced with the gynecologist should follow. Any sexual misconduct or suspected misconduct should be reported to appropriate authorities, such as medical licensing boards, hospital disciplinary boards, or other appropriate institutional officials.

Incorrect Answers: A, B, C, and E.

"I am under no obligation to report any romantic relationship to a disciplinary board" (Choice A), is incorrect. ACOG guidelines state that medical professionals are obligated to report sexual misconduct or suspected misconduct to appropriate authorities, such as medical licensing boards, hospital disciplinary boards, or other appropriate institutional officials.

"If you switch gynecologists it would be acceptable for your former gynecologist to begin a romantic relationship with you immediately" (Choice B), is incorrect. Romantic relationships subsequent to the physician-patient relationship may be influenced by the prior relationship, creating further ethical dilemmas.

"A mutually consensual romantic relationship between patient and physician can sometimes be justified" (Choice C), is incorrect. Given the asymmetric nature of the physician-patient relationship, patients are not capable of providing consent within this context.

"Would you mind telling me who your gynecologist is" (Choice E) is an appropriate question but may cause alarm and impair further discussion. The patient should first be informed that such a relationship is inappropriate. A more thorough discussion about what the patient has experienced should be pursued before attempting to obtain information that will allow reporting to appropriate authorities.

Educational Objective: The American College of Obstetricians and Gynecologists guidelines state that sexual or romantic relationships between a gynecologist and a current patient are always unethical and may be grounds for investigation or criminal prosecution. Pursuing a romantic relationship concurrently with the physician-patient relationship may be viewed as sexual misconduct by medical regulatory authorities.

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8. A healthy 52-year-old man comes to the physician for a routine total colonoscopy. He has no history of blood in his stool or rectal bleeding. There is no family history of colorectal polyps or cancer. He takes no medications and has never smoked cigarettes. Physical examination shows no abnormalities. Colonoscopy shows a 3-mm pedunculated polyp in the cecum. No other abnormalities are noted. The polyp is completely excised. Histopathologic evaluation shows dysplastic-appearing columnar epithelial cells confined by the basement membrane, lining a fibrovascular stalk. Which of the following is the most appropriate recommendation for future screening for colon cancer in this patient?

A) Colonoscopy in 1 year
B) Colonoscopy in 3 years
C) Colonoscopy in 10 years
D) Flexible sigmoidoscopy in 1 year
E) No further screening is indicated unless annual test of the stool for occult blood is positive

Correct Answer: B.

The United States Preventive Services Task Force recommends routine colorectal cancer screening for all patients beginning at age 45 years and continuing until age 75 years. Colorectal cancer is common, and early detection and treatment have been shown to reduce morbidity and mortality. Colonoscopy remains the gold standard screening test as it allows direct visualization and excision of polyps throughout the length of the colon. Other direct visualization tests such as flexible sigmoidoscopy may be acceptable for some patients. Other testing strategies include stool-based tests, such as fecal occult blood and fecal immunochemical (FIT) tests, and CT colonography. A variety of screening intervals are acceptable and recommended by national governing bodies, with many patients undergoing either colonoscopy every 10 years, annual FIT screening, screening every 10 years with flexible sigmoidoscopy and FIT, or screening every 5 years with CT colonography. In the event that adenomatous polyps or early stage colon cancer is identified, closer follow up may be necessary. Careful risk stratification should be performed based on colonoscopy results to determine an appropriate follow-up interval. This patient's colonoscopy shows a polyp with dysplasia, which places him at increased risk for colon cancer. Colonoscopy should be repeated in 3 years for patients with 5 to 10 tubular adenomas or sessile polyps less than 10 mm in diameter, one tubular adenoma or sessile polyp greater than 10 mm in diameter, multiple serrated sessile polyps, or adenomas or sessile polyps with dysplasia or with villous or tubulovillous histology that are completely removed.

Incorrect Answers: A, C, D, and E.

Repeat colonoscopy in 1 year (Choice A) is indicated for patients with more than 10 adenomas.

Colonoscopy in 10 years (Choice C) is appropriate for patients with normal colonoscopy findings. Patients with abnormal colonoscopy results require closer follow up.

Flexible sigmoidoscopy in 1 year (Choice D) is not recommended for patients with a previous abnormal colonoscopy, as this evaluation would insufficiently assess the entire colon.

No further screening unless annual test of the stool for occult blood is positive (Choice E) is incorrect. Appropriate risk stratification of colonoscopy results reduces the risk for colon cancer. Occult blood testing may indicate colon cancer but is neither sensitive nor specific.

Educational Objective: The United States Preventive Services Task Force recommends routine colorectal cancer screening for all patients beginning at age 45 years and continuing until age 75 years. In the event that adenomatous polyps or early stage colon cancer is identified, closer follow up may be necessary. For patients with adenomas or sessile polyps with dysplasia or with villous or tubulovillous histology that are completely removed, colonoscopy should be repeated in 3 years.

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9. A healthy 18-month-old boy is brought for a well-child examination. He was born at 37 weeks' gestation, needed no resuscitation, and had no neonatal problems. He was fed formula for the first 2 months of life, and then his mother substituted cow's milk because of the expense of the formula. He has received no supplements or medications. Examination shows no abnormalities. This child is at greatest risk for which of the following?

A) Iron deficiency anemia
B) Pellagra
C) Protein-calorie malnutrition
D) Vitamin B_{12} (cobalamin) deficiency
E) Vitamin D deficiency

Correct Answer: A.

Neonates and infants fed with only whole cow's milk are at risk for developing iron deficiency anemia. Both breast milk and cow's milk contain low concentrations of iron. The iron in breast milk has a high bioavailability while bovine milk proteins impair iron absorption in human infants. In addition to poor absorption, cow's milk is associated with increased occult enteric bleeding that contributes to iron loss during infancy. Most infants eventually tolerate cow's milk later in life. Iron deficiency anemia early in life can lead to significant neurocognitive and psychomotor impairments that persist even after treatment.

Incorrect Answers: B, C, D, and E.

Pellagra (Choice B) is caused by an acquired deficiency of niacin (nicotinic acid). It is characterized by diarrhea, dementia, and dermatitis. Signs of protein-calorie malnutrition are not present. Pellagra-like symptoms can also be seen in Hartnup disorder, an autosomal recessive disorder caused by decreased gastrointestinal absorption of tryptophan, the precursor to nicotinic acid.

Protein-calorie malnutrition (Choice C) encompasses a broad range of clinical presentations caused by severe deficiency in total body protein and/or caloric intake. Infants and children may present with failure to thrive, muscle atrophy, and stunted growth.

Vitamin B_{12} (cobalamin) deficiency (Choice D) results in megaloblastic anemia, which presents with macrocytosis and hypersegmented neutrophils. It is more common in patients who chronically abuse alcohol or in patients with a Roux-en-Y gastric bypass, Crohn disease, or malabsorptive disorders. It is not associated with substituted cow's milk feedings.

Vitamin D deficiency (Choice E) in childhood, or rickets, commonly results from low exposure to ultraviolet radiation and low dietary vitamin D intake (particularly from low vitamin D in breast milk). Signs of protein-calorie malnutrition are not present.

Educational Objective: Neonates and infants fed with only whole cow's milk are at risk for developing iron deficiency anemia. Breast milk or iron-fortified formula is recommended for the first year of life.

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10. A 5-year-old girl is brought to the physician as a new patient for an examination prior to starting kindergarten. She was noted to have high blood pressure by a previous physician 3 years ago. Her blood pressure 2 years ago was within normal limits. She has not been seen by a physician since that time because her mother did not have adequate health insurance. The patient is at the 50th percentile for height and 15th percentile for weight. Her temperature is 36.7°C (98°F), pulse is 80/min, respirations are 25/min, and blood pressure is 140/90 mm Hg. A bruit is heard over the right aspect of the midabdomen. No other abnormalities are noted. Renal arteriography shows stenosis of the right renal artery. Which of the following is the most appropriate next step in management?

A) Weight loss program
B) Warfarin therapy
C) Angioplasty
D) Renal transplant
E) No treatment is indicated

Correct Answer: C.

Secondary hypertension (hypertension with an identifiable medical cause), in contrast to primary or essential hypertension, accounts for a greater proportion of hypertension in children than in adults. This commonly occurs as a result of kidney or renovascular disease, including renal artery stenosis. Reduction in renal perfusion leads to activation of the renin-angiotensin cascade, with a subsequent increase in renal volume retention and blood pressure. Renal artery stenosis in children may be an isolated finding, or it may be associated with fibromuscular dysplasia or neurofibromatosis type1. Treatment options for secondary hypertension associated with renal artery stenosis in children include calcium channel blockers (CCBs) or angioplasty. CCBs are generally preferable to other agents, such as thiazide diuretics or angiotensin receptor blockers, both of which can result in reduced glomerular filtration and a greater risk for hyperkalemia. Angioplasty is often reserved for patients who fail oral antihypertensive treatment.

Incorrect Answers: A, B, D, and E.

Weight loss program (Choice A) is useful for the management of primary or essential hypertension in children and adolescents. Weight loss is not helpful for patients with hypertension secondary to renal artery stenosis.

Warfarin therapy (Choice B) is not useful for the treatment of hypertension secondary to renal artery stenosis and carries an increased risk for bleeding.

Renal transplant (Choice D) may be necessary for children with hypertension secondary to end-stage kidney disease, which may occur in a variety of conditions, such as polycystic kidney disease or recurrent pyelonephritis. Renal transplant is not necessary for patients with renovascular disease, as the underlying pathology is located within the renal artery.

No treatment is indicated (Choice E) is incorrect. Untreated hypertension in children is associated with increased morbidity and mortality during adult life caused by cardiovascular disease and atherosclerosis.

Educational Objective: Secondary hypertension may occur in children, often caused by kidney or renovascular disease, including renal artery stenosis. Treatment options for secondary hypertension associated with renal artery stenosis in children include calcium channel blockers or angioplasty.

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11. A 42-year-old woman, gravida 1, para 1, comes to the office for a routine examination. She is concerned about her risk for coronary artery disease. She has irritable bowel syndrome and migraines. Medications are sumatriptan and ibuprofen as needed. Her father has hypertension and hyperlipidemia. Her paternal uncle was diagnosed with coronary artery disease at the age of 50 years. The patient smoked one pack of cigarettes daily for 10 years but quit 7 years ago. She drinks two glasses of wine weekly. She does not use illicit drugs. She runs 3 miles one to three times weekly. She is 168 cm (5 ft 6 in) tall and weighs 77 kg (170 lb); BMI is 27 kg/m^2. Blood pressure is 118/70 mm Hg. Examination shows no other abnormalities. Results of fasting serum studies are shown:

Glucose	82 mg/dL
Cholesterol, total	255 mg/dL
HDL-cholesterol	85 mg/dL
LDL-cholesterol	155 mg/dL
Triglycerides	70 mg/dL

The risk assessment score for her 10-year probability of coronary artery disease is 0.4%. The patient is counseled about maintaining a diet low in saturated fat and continuing her exercise regimen. Which of the following is the most appropriate next step in management?

A) Cardiac stress scintigraphy
B) Daily aspirin therapy
C) Echocardiography
D) HMG-CoA reductase inhibitor therapy
E) No intervention is indicated at this time

Correct Answer: E.

Cardiovascular disease, including coronary artery disease, is a major cause of morbidity and mortality in the United States. Risk factors for its development include obesity, tobacco use, diabetes mellitus, hypertension, hyperlipidemia, poor diet, and lack of exercise. Modifying these risk factors with lifestyle changes or medications can decrease the risk for development of coronary artery disease. However, medications can be associated with adverse effects, and their initiation should be guided by the evaluation of risks and benefits in each individual patient. This patient has evidence of hyperlipidemia with increased total cholesterol and LDL-cholesterol concentrations. In general, if a patient's LDL-cholesterol concentration is below 190 mg/dL, the decision to start a statin, or HMG-CoA reductase inhibitor, is based on the 10-year cardiovascular disease risk. In a patient with a cardiovascular risk of less than 5%, the risks of a statin medication often outweigh the benefits. In contrast, if a patient's cardiovascular risk is greater than 10%, starting a statin medication is indicated. Initiation of aspirin follows similar rationale, with the risks outweighing the benefit in those with a low cardiovascular risk. Therefore, while this patient has hyperlipidemia, no further intervention is indicated at this time.

Incorrect Answers: A, B, C, and D.

Cardiac stress scintigraphy (Choice A), or a nuclear stress test, is designed to evaluate for ischemic disease of the heart. Perfusion of the heart is evaluated before and after stress, either by exercise or by a pharmacologic agent, thereby indicating areas of ischemia. It is often used in the evaluation of angina or in patients with a high pretest probability of coronary artery disease. This patient is asymptomatic and has low risk for cardiovascular disease, making this test inappropriate.

Daily aspirin therapy (Choice B) is indicated as primary prevention in those patients who have a 10-year cardiovascular risk of greater than 20%. It can also be considered in those at intermediate risk after the discussion of benefits and risks, including the increased risk for bleeding. This patient is at low risk for cardiovascular disease, making daily aspirin therapy unnecessary.

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Echocardiography (Choice C) is ultrasonography of the heart used to identify structural abnormalities. This patient has no concerning cardiac symptoms or signs of cardiac dysfunction on physical examination. Echocardiography is not warranted.

HMG-CoA reductase inhibitor therapy (Choice D), or statin therapy, is indicated in the treatment of hyperlipidemia if LDL-cholesterol exceeds 190 mg/dL or if the patient has an increased risk for cardiovascular disease. This patient's risk is less than 1%. Thus, statin therapy is not indicated.

Educational Objective: The risk for cardiovascular disease can be decreased by lifestyle modifications and treatment of risk factors, such as obesity, tobacco use, diabetes mellitus, hypertension, and hyperlipidemia. While medical management of hyperlipidemia can decrease the risk for coronary artery disease, it can also cause adverse effects. Thus, the decision to start a statin should be based on consideration of an individual patient's risks and benefits. Those with LDL-cholesterol concentrations greater than 190 mg/dL or those with a greater than 10% 10-year cardiovascular risk should be prescribed a statin, while those with a less than 5% risk should undergo routine screening and follow-up evaluation.

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12. An investigator would like to determine if a new medication for chronic obstructive pulmonary disease (COPD) decreases hospitalization rates in adults who come to the emergency department (ED) because of an exacerbation. All patients with COPD who come to the ED because of an exacerbation will be invited to participate in the study. Patients will be randomly assigned to receive the new medication plus standard therapy or standard therapy alone during the hours that a study nurse is present (7 AM to 7 PM daily). Patients who come to the ED outside of these hours will not be enrolled in the study. Physicians treating the patients will be blinded to the group assignments. Outcomes will be assessed by a physician not involved in the care of the patients. Which of the following is the greatest limitation of this study design?

A) Generalizability
B) Inadequate blinding of outcome assessors
C) Lack of a placebo group
D) Lead-time bias

Correct Answer: A.

Generalizability refers to the ability to apply the results of a study conducted with a sample population to the population at large and reflects the external validity of the study. Generalizability or external validity can be affected by various factors, such as sampling bias (in which the sample population does not reflect the population at large), or the Hawthorne effect (in which the sample population alters its behavior in response to testing or awareness of being under study). In contrast, internal validity describes the ability of a study to attribute its findings to the cause-effect relationship under study, while also excluding alternative explanations for the observations. While rigorous experimental design and standardized procedures are important for establishing internal validity, choices that affect experimental design may result in poor generalizability or external validity. In this scenario, choosing to sample only patients who present to the emergency department while a study nurse is present during the day ensures that there is standardization of care but creates sampling bias that limits generalizability, since patients in the population at large also present at night.

Incorrect Answers: B, C, and D.

Inadequate blinding of outcome assessors (Choice B) is incorrect. Blinding is a technique for masking the status of the treatment (experimental, standard of care, or placebo) from either the experimenter, physician administering the treatment, or the patient. Blinding is helpful for reducing bias that may result from awareness of the treatment being administered. The experimental design in this scenario is most limited by sampling bias, rather than by an issue with blinding.

Lack of a placebo group (Choice C) is incorrect. The use of a placebo is inappropriate in situations where an effective treatment is known to exist. A placebo should not be used in situations where its use could cause harm. In such scenarios, it is appropriate to compare the experimental treatment against the standard of care.

Lead-time bias (Choice D) is incorrect. Lead-time bias is a form of bias that describes earlier screening for a disease leading to earlier detection of the disease, with a resultant, incorrect observation of increased survival time.

Educational Objective: Generalizability refers to the ability to apply the results of a study conducted with a sample population to the population at large and reflects the external validity of the study. Generalizability or external validity can be affected by various factors. In this scenario, sampling only patients who present during the day creates sampling bias that limits the applicability of the study to the population at large.

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13. A 57-year-old man is brought to the emergency department by his neighbors, who found him lying unconscious in a puddle of vomit in his apartment. He has a 20-year history of alcohol use disorder. On arrival, he is lethargic and reports shortness of breath. He is unable to provide a medical history. His temperature is 39°C (102.2°F), pulse is 98/min, respirations are 28/min, and blood pressure is 132/76 mm Hg. Diffuse crackles are heard bilaterally. Arterial blood gas analysis on room air shows:

pH	7.44
Pco_2	30 mm Hg
Po_2	48 mm Hg

An x-ray of the chest shows pulmonary infiltrates bilaterally. Which of the following is the most appropriate next step in management?

A) Hyperbaric oxygen therapy
B) Intravenous administration of dobutamine
C) Intravenous administration of methylprednisolone
D) Bronchoscopy with lavage
E) Intubation and mechanical ventilation

Correct Answer: E.

This patient is likely suffering from acute respiratory distress syndrome (ARDS). ARDS is characterized by acute onset; diffuse, inflammatory lung injury; and bilateral pulmonary infiltrates on chest imaging leading to hypoxic respiratory failure. There are numerous causes, including sepsis (especially in the setting of gram-negative bacteria caused by macrophage overactivation by lipopolysaccharide), pneumonia, chemical pneumonitis (eg, aspiration, likely in this case with the possibility of bacterial aspiration pneumonia), pulmonary contusion, acute pancreatitis, trauma, transfusions, medications, and amniotic fluid embolism. Alveolar damage and inflammation lead to increased permeability of the alveolar-capillary interface. Urgent endotracheal intubation should occur in patients who are apneic, hypoxic, unable to protect their airway (eg, lethargic, no gag or cough reflex), or hypercapnic and not responding to less invasive means. Intubation and mechanical ventilation is the most appropriate next step in management of this condition to secure the airway and ensure adequate oxygenation and ventilation.

Incorrect Answers: A, B, C, and D.

Hyperbaric oxygen therapy (Choice A) is a treatment indicated for carbon monoxide (CO) poisoning. Symptoms of CO poisoning include headache, lightheadedness, nausea, and altered mental status. Acute management involves removing the patient from the exposure and treatment with 100% supplemental oxygen to displace CO from hemoglobin. Severe cases and high-risk patients demonstrating any degree of neurologic deficit or significant end-organ dysfunction should be treated with hyperbaric oxygen therapy.

Intravenous administration of dobutamine (Choice B) would be indicated in the treatment of cardiogenic shock. This patient has a fever and no history of heart failure, making cardiogenic shock less likely and septic shock more likely. At present, his heart rate and blood pressure are within normal limits, indicating that no pressor or inotropic support is needed at this time.

Intravenous administration of methylprednisolone (Choice C) is used in the treatment of allergic, autoimmune, and inflammatory conditions such as asthma, Crohn disease, and gout. It is not clear whether steroids are helpful in ARDS; they would not be the next step in management.

Bronchoscopy with lavage (Choice D) can be indicated in diagnosis of some infections such as tuberculosis and *Pneumocystis jirovecii* pneumonia. This patient is without known immunocompromise

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PO_2 48 mm Hg

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Bronchoscopy with lavage (Choice D) can be indicated in diagnosis of some infections such as tuberculosis and *Pneumocystis jirovecii* pneumonia. This patient is without known immunocompromise, making these infections less likely.

Educational Objective: Acute respiratory distress syndrome results in diffuse inflammatory lung injury and hypoxic respiratory failure. Patients experiencing hypoxic respiratory failure with limited ability to protect the airway require treatment involving intubation and mechanical ventilation.

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14. A 37-year-old woman is scheduled for arthroscopic repair of a right medial meniscus tear. Her procedure is the surgeon's last scheduled operation of the day. All previous procedures this day involved the left knee. In the operating room, the resident prepares the left knee for the operation. The operation is discontinued after the surgeon discovers no meniscus tear, and the patient is informed about the error. Which of the following is the best approach to prevent future errors of this type?

A) Asking the surgeon to resign from the medical staff
B) Having the surgeon and resident present the case at the next morbidity and mortality conference
C) Having the surgeon mark the surgical site with input from the patient prior to induction of anesthesia
D) Having the surgeon review the chart just prior to the procedure
E) Placing an incident report in the files of the resident and surgeon

Correct Answer: C.

"Wrong site" surgery is a rare but potentially catastrophic form of surgical error that is likely to result in malpractice litigation. "Wrong site" surgery can result in potentially serious harm, such as inappropriate amputation or unnecessary surgery. Procedures for preoperative verification and surgical marking are essential in preventing "wrong site" errors. Physicians should be familiar with The Joint Commission Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery. Steps include preoperative verification of the patient's identity, the procedure to be performed, and the surgical site. The patient should be involved in the verification process whenever possible, and any discrepancies or questions should be addressed. The use of a checklist can assist in ensuring a standardized verification process. The surgical site should be marked by the surgeon who will perform the procedure, and the surgical mark should be both unambiguous and positioned such that it will be visible after the surgical drape is placed. Additionally, a final verification "time out" should be performed prior to induction of anesthesia to verify the patient's identity, the procedure, and the surgical site.

Incorrect Answers: A, B, D, and E.

Asking the surgeon to resign from the medical staff (Choice A) or placing an incident report in the files of the resident and surgeon (Choice E) are unnecessary and unlikely to contribute significantly to preventing similar errors in the future. "Wrong site" errors are often multifactorial and typically result in a significant, negative impact on the surgeon involved in addition to the patient. The occurrence of a single error does not necessarily imply that the surgeon is unfit to continue practicing medicine. The surgical team should be involved in a root cause analysis with hospital staff and risk management to reduce the risk for similar errors in the future.

Having the surgeon and resident present the case at the next morbidity and mortality conference (Choice B) may be a useful adjunctive approach for promoting awareness of the possibility of "wrong site" errors and of emphasizing the importance of following the Universal Protocol. However, this does not supersede the importance of appropriate surgical marking.

Having the surgeon review the chart just prior to the procedure (Choice D) is appropriate but is not a substitute for preoperative verification. Additionally, involving the patient directly in the verification process can greatly reduce the likelihood of "wrong site" errors.

Educational Objective: "Wrong site" surgery is a rare but potentially catastrophic form of medical error that may result in serious patient harm, and that is likely to result in malpractice litigation. Physicians should be familiar with The Joint Commission Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery. A thorough, standardized process should be followed to verify the patient's identity, procedure to be performed, and surgical site prior to beginning surgery.

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15. A 52-year-old woman comes to the office because of a 6-week history of moderate epigastric pain and an intermittent mild, midsternal burning sensation when she eats. She has had a 4.5-kg (10-lb) weight loss during the past 6 months despite no change in appetite. During this time, she also occasionally has had dark stools. She has type 2 diabetes mellitus, hypertension, and osteoarthritis. Her medications are metformin, hydrochlorothiazide, and ibuprofen. She has smoked one pack of cigarettes daily for 36 years. She appears malnourished. She is 163 cm (5 ft 4 in) tall and weighs 54 kg (120 lb); BMI is 21 kg/m^2. Her pulse is 86/min, and blood pressure is 110/65 mm Hg. Examination shows mild epigastric tenderness. There is no hepatosplenomegaly. The remainder of the examination shows no abnormalities. Her hematocrit is 30%, leukocyte count is 6200/mm^3, and platelet count is 530,000/mm^3. Serum electrolyte concentrations are within the reference ranges. In addition to discontinuing ibuprofen therapy, which of the following is the most appropriate next step in management?

A) Celecoxib therapy
B) Esophagogastroduodenoscopy
C) Follow-up examination in 6 weeks
D) Pantoprazole therapy and follow-up examination in 6 weeks
E) Serologic testing for *Helicobacter pylori*

Correct Answer: B.

Esophagogastroduodenoscopy is used to evaluate the esophagus, stomach, and the duodenum, and can diagnose conditions such as peptic ulcer disease, esophagitis, or esophageal cancer among others. This patient has features suggestive of an esophageal or gastric cancer given unintentional weight loss and upper gastrointestinal bleeding leading to occasional dark stools. Ibuprofen and other nonsteroidal anti-inflammatory drugs (NSAIDs) can cause gastric mucosal irritation leading to upper gastrointestinal bleeding and should be stopped in the setting of epigastric pain and dark stools. Upper gastrointestinal bleeding in the setting of malnourishment and/or unintentional weight loss should be evaluated directly with esophagogastroduodenoscopy. Gastric cancer classically presents with weight loss, early satiety, and melena in a patient with a history of smoking, peptic ulcer disease, chronic gastritis, or frequent consumption of nitrate-containing foods.

Incorrect Answers: A, C, D, and E.

Celecoxib therapy (Choice A) would be contraindicated, as celecoxib is an NSAID that can cause or worsen gastric mucosal irritation. Patients with evidence of upper gastrointestinal bleeding should avoid NSAIDs.

Follow-up examination in 6 weeks (Choice C) would not be appropriate as the upper gastrointestinal bleeding and weight loss should be addressed and investigated.

Pantoprazole therapy and follow-up examination in 6 weeks (Choice D) would be appropriate for peptic ulcer disease. Peptic ulcer disease classically presents with abdominal pain related to the consumption (gastric) or lack of consumption (duodenal) of food. Peptic ulcer disease is strongly associated with infection from the bacterium *Helicobacter pylori*. If a patient has any risk factors for *H. pylori* infection, serologic testing should be performed (Choice E). Eradication therapy using a triple or quadruple combined therapy for *H. pylori* infection can eliminate the bacterium and permit healing of the peptic ulcer, generally with few complications, if managed promptly.

Educational Objective: Upper gastrointestinal bleeding in the setting of malnourishment and unintentional weight loss raises suspicion for gastric cancer and should be evaluated directly with esophagogastroduodenoscopy.

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16. A 67-year-old man comes to the physician because of a 6-month history of increasing difficulty walking. He has not had pain or numbness. He has no history of serious illness or recent infection. Examination of the lower extremities shows atrophy; muscle strength is 3/5 bilaterally. Deep tendon reflexes are increased in the lower extremities. Sensation is intact. Which of the following is the most likely diagnosis?

A) Amyotrophic lateral sclerosis
B) Multiple sclerosis
C) Myasthenia gravis
D) Polymyositis
E) Transverse myelitis

Correct Answer: A.

Amyotrophic lateral sclerosis is a progressive neurodegenerative disorder typically beginning in midlife that affects both lower motor neurons arising from the anterior horns of the spinal cord and upper motor neurons of the lateral corticospinal tract within the brain and spinal cord. Neurons degenerate as a result of an unknown cause that may involve RNA processing and/or excitotoxicity, and gliosis results. Patient presentations are variable though typically feature a combination of upper motor neuron (eg, increased muscle tone, hyperreflexia, Babinski sign) and lower motor neuron findings (eg, decreased muscle tone, hyporeflexia, early muscle atrophy) in an asymmetric distribution that may include the bulbar muscles. Some patients may experience cognitive or behavioral changes, though other patients are cognitively normal. The diagnosis is primarily clinical but may be supported by electromyographic findings of acute and chronic denervation and reinnervation, along with nerve conduction studies showing reduced compound muscle action potentials caused by denervated and atrophied muscles. MRI of the brain and spine should be performed to rule out other diseases. Treatment should include riluzole, which may modestly improve survival but does not cure the disease.

Incorrect Answers: B, C, D, and E.

Multiple sclerosis (Choice B) is an autoimmune demyelinating disease that typically presents in white women in their fourth decade of life. It is characterized by central nervous system demyelination of white matter in both the brain and the spinal cord. This leads to weakness, hyperreflexia, and spasticity. Optic neuritis is a classic presenting diagnosis. Transverse myelitis (Choice E) is another subtype of demyelinating disease, often idiopathic in cause, that produces bilateral sensory, motor, and/or autonomic dysfunction, often with a clearly identifiable spinal level below which normal function is reduced or absent.

Myasthenia gravis (Choice C) is an autoimmune disorder of neuromuscular transmission that has a bimodal age of onset, peaking in both young adults (teens to 20s) and older adults (50s to 60s). Patients typically present with progressively worsening muscle weakness, usually involving the ocular, bulbar, and neck muscles.

Polymyositis (Choice D) is an autoimmune inflammatory myopathy that presents with symmetrical proximal muscle weakness, most commonly in women. Patients typically present with difficulty performing overhead tasks, rising from a seated position, and climbing stairs.

Educational Objective: Amyotrophic lateral sclerosis is a progressive neurodegenerative disorder that affects the anterior horns of the spinal cord and the lateral corticospinal tract. Subsequently, patients demonstrate a combination of upper and lower motor neuron findings in an asymmetric distribution.

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17. A 14-year-old girl is brought to the physician because of an 18-hour history of persistent right-sided lower abdominal pain. She has not had fever, vomiting, or diarrhea. She has no history of serious illness or operative procedures. Menarche was at the age of 12 years, and menses occur at regular 28-day intervals. Her last menstrual period was 2 weeks ago. She is not sexually active. Her temperature is 37°C (98.6°F), pulse is 72/min, respirations are 14/min, and blood pressure is 120/80 mm Hg. Abdominal examination shows mild tenderness with guarding over the right lower quadrant. There is no distention, and bowel sounds are normal. The remainder of the examination shows no abnormalities. Her hemoglobin concentration is 13.9 g/dL, and leukocyte count is 8000/mm^3 with a normal differential. Urinalysis shows no abnormalities. Abdominal ultrasonography shows a small amount of fluid in the pelvis. Which of the following is the most likely diagnosis?

A) Appendicitis
B) Ectopic pregnancy
C) Mittelschmerz
D) Ovarian torsion
E) Pelvic inflammatory disease

Correct Answer: C.

Mittelschmerz is a common cause of abdominopelvic pain in females. It is caused by peritoneal irritation in the setting of an enlarging ovarian follicle or its rupture during egg release. It commonly presents with mid-cycle unilateral abdominopelvic pain, associated with mild abdominal tenderness, in patients with regular menstrual cycles. As the pain is secondary to normal physiological hormonal changes and not pathologic, vital signs and results of laboratory studies will be within normal limits. While ultrasonography is not necessary for diagnosis, it is often ordered as mittelschmerz can mimic appendicitis. If completed, it would be expected to show a small amount of free fluid in the pelvis secondary to follicular rupture, as seen in this patient.

Incorrect Answers: A, B, D, and E.

Appendicitis (Choice A) classically presents with right lower quadrant abdominal pain that is often periumbilical at onset, nausea, anorexia, fever, leukocytosis, and tenderness to palpation in the right lower quadrant. This patient has mild abdominal pain but no nausea or leukocytosis. Additionally, appendicitis or secondary signs related to it would likely be seen on an abdominal ultrasonography.

Ectopic pregnancy (Choice B) is an abnormal extrauterine pregnancy (eg, in the fallopian tube, cervix, ovary, or peritoneum). It commonly presents with vaginal bleeding, abdominopelvic pain, and increased β-hCG. This patient is not sexually active, which makes an ectopic pregnancy unlikely.

Ovarian torsion (Choice D) is caused by twisting of the ovary about its ligamentous attachment with resultant compromise of its blood supply leading to ovarian ischemia. Patients present with sharp, severe, unilateral lower abdominal or pelvic pain, often accompanied by nausea and vomiting. The absence of blood flow to the ovary would be expected on ultrasonography.

Pelvic inflammatory disease (Choice E) is inflammation of the uterus, fallopian tubes, or ovaries, and usually occurs secondary to infection with the sexually transmitted organisms *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. It may also occur because of introduced gastrointestinal flora. It presents with abnormal cervical discharge, cervicitis, and cervical motion tenderness. Peritonitis may ensue in advanced cases. This patient is not sexually active, which makes pelvic inflammatory disease unlikely.

Educational Objective: Mittelschmerz describes mild mid-cycle, often unilateral, pain caused by peritoneal irritation in the setting of follicular development and rupture. It is a benign process, and is not associated with any significant hemodynamic, laboratory, or radiologic abnormalities. It can mimic appendicitis; ultrasonography may be necessary to determine the diagnosis.

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18. A 62-year-old man, who underwent right below-the-knee amputation 36 years ago, comes to the emergency department because of a 1-month history of an ulcer on the end of the residual limb. His amputation was the result of injuries he sustained while serving in the military. He says his prosthetic socket has "felt loose and has been rubbing recently." During the past 6 months, he has had progressive difficulty walking because of sharp pain that radiates up his leg. The pain has been occurring earlier during his walks; it slowly improves with rest. He previously walked 1 mile daily for exercise and could walk several miles without stopping. He has not had vomiting, fever, chills, or malaise. He has type 2 diabetes mellitus treated with diet. One month ago, his hemoglobin A_{1c} was 6%. Vital signs are within normal limits. Examination of the right lower extremity shows mild erythema and a 1 × 1-cm ulcer, with a depth of 3 mm, over the anteromedial aspect of the limb. There is viable soft tissue, and margins are clear. The limb is warm. The popliteal pulse is 1+. In addition to a recommendation for non-weight bearing and avoidance of direct pressure to the site, which of the following is the most appropriate next step in management?

A) MRI of the right lower extremity
B) Recommendation for refitting of the prosthetic socket
C) Surgical revision of the amputation site
D) Wound culture and antibiotic therapy
E) X-ray of the right lower extremity

Correct Answer: B.

Pressure injury, also known as a decubitus ulcer, is a common complication in patients who utilize a limb prosthesis. In most cases, the injury can be managed conservatively by avoiding aggravating factors and direct pressure to the site. For this patient, a recommendation for refitting of the prosthetic socket is appropriate given his report of the prosthesis feeling loose and rubbing recently. Several factors can contribute to an ill-fitting prosthesis, including changes in weight and body habitus, variations in activity levels and mobility, and general wear and tear on the unit. The region of skin interacting with the prosthesis is subject to high amounts of moisture and shear forces that result in pressure injury. Additional complications include infection, of which this patient is not displaying concerning signs or symptoms. Close follow-up is recommended to ensure appropriate healing of the wound and monitor for developing infection.

Incorrect Answers: A, C, D, and E.

MRI of the right lower extremity (Choice A) is not necessary for routine assessment of pressure injury. Imaging can be performed if the patient has high-risk features such as indwelling medical devices or if there are systemic signs of infection. MRI is the preferred imaging modality to assess for underlying abscess and/or osteomyelitis.

Surgical revision of the amputation site (Choice C) is an invasive management strategy that is not warranted at this time. Pressure injury complicated by infection or a significant burden of necrotic tissue may benefit from surgical debridement.

Wound culture and antibiotic therapy (Choice D) are not indicated. Soft tissue infection generally presents with warmth, erythema, pain, and purulent discharge at the ulcer site as well as systemic signs of infection, including fever and malaise.

X-ray of the right lower extremity (Choice E) is not recommended in the evaluation of pressure ulcer complications, as it is not sensitive nor specific enough to rule out infection. MRI is the preferred imaging modality.

Educational Objective: Decubitus ulcers, or pressure injuries, are a common complication encountered in clinical practice, most commonly occurring at sites of repetitive friction or where a bony prominence contacts an external surface. Initial management consists of local wound care, assessing for skin, soft tissue, and bone infection, and addressing the source of the injury.

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19. A 40-year-old man comes to the physician 6 days after noticing a nonpainful lump in his neck. He also has a 2-week history of palpitations. He is otherwise asymptomatic. He has no history of serious illness and takes no medications. His temperature is 37.2°C (99°F), pulse is 110/min, respirations are 16/min, and blood pressure is 134/60 mm Hg. Examination shows a 1.4-cm, firm thyroid nodule. His serum thyroid-stimulating hormone concentration is less than 0.05 mIU/L, and serum free thyroxine concentration is 3.5 ng/dL (N=0.9–1.7). Which of the following is the most appropriate next step in management?

A) Fine-needle aspiration biopsy of the nodule
B) Measurement of serum calcitonin concentration
C) Operative resection of the nodule
D) Radioactive iodine uptake scan
E) Ultrasonography of the thyroid gland

Correct Answer: D.

Discovery of a palpable thyroid mass by a patient at home or during a routine clinical visit is a common occurrence, and the diagnostic workup focuses on ruling out malignancy. Risk factors for thyroid malignancy include young age (the prevalence of benign thyroid nodules increases with age), radiation exposure to the head or neck, and a family history of thyroid cancer or associated congenital neoplastic syndrome (eg, multiple endocrine neoplasia, type 2). All patients with a new nodule should be evaluated with serum TSH measurement and, if the TSH concentration is low, a radioactive iodine uptake scan (thyroid scintigraphy) should be ordered. A low TSH concentration indicates a hyperfunctioning nodule. These are rarely malignant and do not require fine-needle aspiration biopsy. Thyroid ultrasonography should also be performed, and, if the uptake scan was performed initially, fine-needle aspiration biopsy can be avoided. Subsequent workup and management are dependent upon the results of the TSH measurement, ultrasound characteristics of the nodule, and results of the radioactive iodine uptake scan.

Incorrect Answers: A, B, C, and E.

Fine-needle aspiration biopsy of the nodule (Choice A) can be avoided in patients who have an area of focal uptake on a radioactive iodine uptake scan and/or benign appearance on thyroid ultrasonography. This patient has a low TSH concentration, and obtaining thyroid scintigraphy prior to ultrasonography is likely to spare him the biopsy.

Measurement of serum calcitonin concentration (Choice B) is an area of active study regarding thyroid nodules and malignancy. The American Thyroid Association currently does not recommend for or against testing levels. The diagnostic value of TSH measurement, thyroid scintigraphy, and thyroid ultrasonography is well established.

Operative resection of the nodule (Choice C) is not necessary prior to identification of the mass. Surgical management may be required for hyperfunctioning nodules refractory to treatment or malignancy.

Ultrasonography of the thyroid gland (Choice E) should be performed in the diagnostic workup but can be done after thyroid scintigraphy as data from the uptake scan will inform whether an ultrasound-guided fine-needle aspiration biopsy is indicated at the time of the study.

Educational Objective: Palpable thyroid masses are a common incidental discovery on physical examination and imaging. Diagnostic workup is necessary to exclude malignancy, and all patients should have their TSH concentration checked and ultrasonography of the thyroid gland performed. A radioactive iodine uptake scan is recommended if the TSH concentration is below the reference range.

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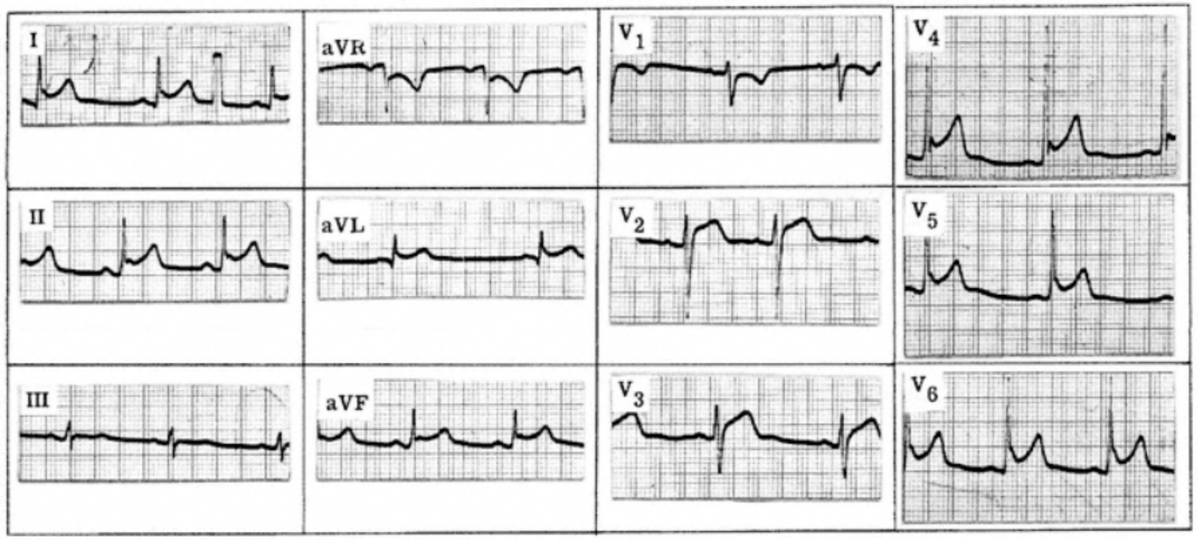

20. A previously healthy 24-year-old man comes to the emergency department because of a 12-hour history of increasing pain to the left of the center of his chest. Initially, the pain was mild and occurred only when he breathed deeply. Now, the pain is more severe and constant. He rates the pain as an 8 on a 10-point scale. The pain increases when he lies on his back, decreases when he leans forward, and does not radiate. He has not had palpitations, shortness of breath, nausea, vomiting, or sweating. He says that he is "recovering from a head cold," which he has had for 14 days. He appears moderately uncomfortable but is in no respiratory distress. His temperature is 37.6°C (99.6°F), pulse is 66/min and regular, respirations are 20/min, and blood pressure is 152/88 mm Hg. Examination, including cardiovascular examination, shows no abnormalities. His serum creatine kinase activity is 420 mg/dL with an MB fraction of 12% (N<5%). An ECG is shown. Which of the following is the most appropriate next step in diagnosis?

A) Echocardiography
B) CT scan of the chest
C) Cardiac MRI
D) Coronary angiography
E) Pericardiocentesis

Correct Answer: A.

Echocardiography is indicated for the assessment of a pericardial effusion in the setting of potential myopericarditis. Pericarditis classically presents with substernal chest pain, which is often pleuritic, worsens when lying down, and improves with leaning forward. It can occur in patients with inflammatory, infectious, or malignant conditions, such as viral infection, systemic lupus erythematosus, tuberculosis, or lymphoma, and can present as a complication of myocardial infarction or cardiac surgery. On examination, pericarditis is disclosed by a diastolic friction rub, described as a harsh sound heard in diastole. The condition is diagnosed clinically and supported by increased inflammatory markers such as erythrocyte sedimentation rate and C-reactive protein. ECG is characterized by diffuse ST

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Incorrect Answers: B, C, D, and E.

CT scan of the chest (Choice B) can provide structural but only limited functional information about the heart, whereas echocardiography permits analysis of structural defects, pressure, velocity, and flow of blood, which is important in understanding the hemodynamics associated with structural heart disease, cardiac inflammation, or pericardial effusion/tamponade.

Cardiac MRI (Choice C) is the gold standard for diagnosis of conditions such as left ventricular hypertrophy and cardiac amyloidosis, though availability, cost, and logistics limit its use as a first-line screening tool.

Coronary angiography (Choice D) is an invasive test performed via percutaneous catheter to assess the anatomy and patency of the coronary arteries. It is indicated for the diagnostic and therapeutic management of acute coronary syndrome (eg, ST-segment elevation myocardial infarction) and for the diagnosis and management of coronary artery disease following an abnormal stress test.

Pericardiocentesis (Choice E) is appropriate for pericardial tamponade or in the workup of a pericardial effusion; however, these diagnoses should first be established with imaging or physical examination.

Educational Objective: Pericarditis classically presents with substernal chest pain, which is often pleuritic, worsens when lying down, and improves with leaning forward. Echocardiography is indicated for the assessment of a pericardial effusion in the setting of pericarditis.

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21. A 21-year-old man is brought to the emergency department by paramedics because of a 10-hour history of altered mental status. The mother says the patient was "fine" last night. This morning, he did not wake up at his usual time; when she went to check on him, she could not get him to wake up. He has no history of serious medical or psychiatric illness and takes no medications. His mother says he does not smoke cigarettes, drink alcohol, or use illicit drugs. On arrival, he is lethargic but not in respiratory distress. He is responsive to painful stimuli. His temperature is 36.7°C (98.0°F), pulse is 120/min, respirations are 26/min, and blood pressure is 135/85 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 100%. Physical examination shows no other abnormalities. Laboratory studies are shown:

Serum	
Na^+	143 mEq/L
K^+	3.8 mEq/L
Cl^-	110 mEq/L
HCO_3^-	13 mEq/L
Urea nitrogen	14 mg/dL
Glucose	120 mg/dL
Osmolality	290 mOsmol/kg H_2O
Urine	
Glucose	none
Ketones	3+

Arterial blood gas analysis is shown:

pH	7.43
Pco_2	22 mm Hg
Po_2	96 mm Hg

Which of the following is the most likely diagnosis?

A) Alcoholic ketoacidosis
B) Diabetic ketoacidosis
C) Ethylene glycol toxicity
D) Methanol toxicity
E) Salicylate toxicity

Correct Answer: E.

Salicylate poisoning in large doses results in a respiratory alkalosis from the stimulation of respiratory centers causing hyperventilation. Subsequently, it results in the development of a delayed anion gap metabolic acidosis secondary to its decoupling effects on the electron transport chain, resulting in increased anaerobic metabolism and the production of lactate and ketoacids beyond the acidic properties of salicylic acid itself. It does not typically affect sodium and potassium serum concentrations. Patients with salicylate toxicity will present with hyperventilation, gastrointestinal upset, hyperthermia, tinnitus, agitation, delirium, and hallucinations. Management of salicylate toxicity involves systemic alkalinization with a sodium bicarbonate infusion. Patients may need dialysis in the setting of severe altered mental

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Incorrect Answers: A, B, C, and D.

Alcoholic ketoacidosis (Choice A) is induced by excessive alcohol intake that results in increased ketone production and a high anion gap metabolic acidosis without hyperglycemia. It would not typically result in a respiratory alkalosis such as with salicylate poisoning.

Diabetic ketoacidosis (Choice B) occurs as a result of the accumulation of serum ketones such as beta-hydroxybutyric acid, acetoacetic acid, and acetone in the setting of deficient insulin signaling. Laboratory studies typically show increased glucose, ketones, and a high anion gap caused by the accumulation of unmeasured anions in serum.

Ethylene glycol toxicity (Choice C) results from metabolism of ethylene glycol by alcohol dehydrogenase to toxic metabolites including glycolate, glyoxylate, and oxalate. Patients present with acute kidney injury, metabolic acidosis, and crystals on urinalysis. Methanol toxicity (Choice D) results similarly from toxic metabolites including formic acid that can cause visual disturbances, retinal edema, optic disc hyperemia, gastrointestinal distress, putaminal hemorrhage, and neurologic depression. Ethylene glycol and methanol toxicity can cause an increased serum osmolality and an osmolar gap.

Educational Objective: Salicylate toxicity can present with hyperventilation, gastrointestinal upset, hyperthermia, tinnitus, agitation, delirium, and hallucinations. Salicylates cause early onset respiratory alkalosis from stimulation of respiratory centers causing hyperventilation, followed by a delayed anion gap metabolic acidosis caused by decoupling of the electron transport chain.

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22. A 25-year-old man is brought to the emergency department 1 hour after sustaining a gunshot wound to the abdomen. He has pain at the bullet entry site. He is awake, alert, and appropriately conversant. His temperature is 38.8°C (101.8°F), pulse is 85/min, respirations are 18/min, and blood pressure is 128/70 mm Hg. Abdominal examination shows a bullet wound 5 cm to the right of the umbilicus. There is moderate tenderness over the entry site. The remainder of the examination shows no abnormalities. During operative exploration, 250 mL of succus entericus and eight small bowel holes are found in the abdomen; the bowel holes are treated by resection of 12 cm of proximal ileum. The intestine is reconstructed with a stapled anastomosis. The midline abdominal fascia is sutured closed. Which of the following methods of skin and soft tissue wound management at this point is most likely to decrease the risk for postoperative wound infection?

A) Delayed primary closure
B) Hand-sewn suture closure of the skin
C) Use of skin staples
D) Application of cyanoacrylate adhesive to the wound
E) Split-thickness skin graft

Correct Answer: A.

Surgical site infection is a relatively common complication of abdominal surgeries associated with increased morbidity and mortality. It often presents with fever, erythema, induration, and pain at the surgical site. Physical examination may show purulent drainage upon palpation of the wound. Deeper abscesses are possible and may be less evident on physical examination. Patient risk factors for the development of surgical site infection include diabetes mellitus, immunosuppression, tobacco use, and increased age. Additionally, traumatic wounds and infected intra-abdominal contents increase the risk for development of infection despite aggressive irrigation. In these patients, delayed primary closure involves leaving the incision open, often with negative pressure wound therapy, to allow any underlying infected tissue to drain. This also enables surgeons to do further irrigation and debridement, if necessary, without reopening the abdomen. This patient presented with a traumatic abdominal wound associated with a perforated viscus and succus entericus, in the setting of a high-grade fever, making the likelihood of a blossoming infection high. Therefore, the most appropriate wound management technique for this patient is delayed primary closure to decrease the risk for postoperative infection.

Incorrect Answers: B, C, D, and E.

Hand-sewn suture closure of the skin (Choice B) is commonly used to close abdominal incisions. Suture closure allows reapproximation of the tissues, which allows healing by primary intention. However, hand-sewn closure of the skin would prevent the surgical tissues from draining in this patient at high risk for intra-abdominal infection, which may lead to intra-abdominal abscess or wound site infection.

Use of skin staples (Choice C) to close abdominal incisions is a common method. There is evidence that staples have a decreased risk for surgical site infection in comparison to hand-sewn closures, as the wound is still able to drain between the staples. However, the use of staples is still inferior to delayed primary closure in preventing surgical site infections.

Application of cyanoacrylate adhesive to the wound (Choice D) is a common technique used on small wounds. Tissue adhesives can allow the approximation of tissue without suture or can strengthen wound approximation in sutured or stapled wounds. However, its use is contraindicated in infected tissues.

Split-thickness skin graft (Choice E) is not necessary. Split-thickness skin grafts are commonly used in burn patients to replace debrided skin. They may be used for traumatic wounds to replace tissue lost during the injury. This patient has no evidence of significant tissue loss. Skin grafts are contraindicated in infected tissue.

Educational Objective: Surgical site infection is a relatively common complication of abdominal surgeries associated with increased morbidity and mortality. Delayed primary closure is a wound management technique used for infected wound sites, such as those as a result of a traumatic injury or those with evidence of contamination. It involves leaving the wound open, often with negative wound pressure therapy, to allow underlying tissues to drain, which decreases the risk for surgical site infection.

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✓ 23. A 32-year-old woman comes to the physician because of a 2-week history of fatigue and increased urination. She has had a 2.3-kg (5-lb) weight loss despite eating more during this time. She has had two urinary tract infections in the past. She takes no medications. She does not smoke cigarettes, drink alcohol, or use illicit drugs. The patient is alert and fully oriented. She is 165 cm (5 ft 5 in) tall and weighs 52 kg (115 lb); BMI is 19 kg/m^2. Her temperature is 36.5°C (97.7°F), pulse is 100/min, respirations are 20/min, and blood pressure is 90/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 100%. The oropharynx is dry. The remainder of the examination shows no abnormalities. Laboratory studies show:

Serum	
Na^+	142 mEq/L
K^+	5.4 mEq/L
Cl^-	104 mEq/L
HCO_3^-	16 mEq/L
Glucose	800 mg/dL
Creatinine	1.3 mg/dL
Urine	
Specific gravity	1.030
Bilirubin	none
Protein	none
RBC	0–5/hpf
WBC	25–50/hpf
Nitrites	positive
Leukocyte esterase	positive
Glucose	>1000 mg/24 h

Which of the following serum hormonal profiles is most consistent with this patient's presentation?

	Insulin	Glucagon	Catecholamines
A)	Decreased	decreased	decreased
B)	Decreased	increased	decreased
C)	Decreased	decreased	increased
D)	Decreased	increased	increased
E)	Increased	increased	decreased
F)	Increased	decreased	increased
G)	Increased	decreased	decreased
H)	Increased	increased	increased

Correct Answer: D.

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	Insulin	Glucagon	Catecholamines
A)	Decreased	decreased	decreased
B)	Decreased	increased	decreased
C)	Decreased	decreased	increased
D)	Decreased	increased	increased
E)	Increased	increased	decreased
F)	Increased	decreased	increased
G)	Increased	decreased	decreased
H)	Increased	increased	increased

Correct Answer: D.

Diabetic ketoacidosis (DKA) presents with fatigue, polyuria, polydipsia, shortness of breath or tachypnea, and diffuse abdominal discomfort, commonly in patients with type 1 diabetes mellitus. It occurs as a result of the accumulation of serum ketones such as ß-hydroxybutyric acid, acetoacetic acid, and acetone in the setting of insulin deficiency. Dysregulated fatty acid degradation and ketone synthesis occurs as a result of the relative state of starvation created by absent insulin signaling. Vital signs may show tachycardia, tachypnea, and hypotension caused by severe dehydration. Laboratory studies typically show metabolic acidosis, increased serum glucose, ketones, and catecholamines, and a high anion gap caused by the accumulation of unmeasured anions in the serum. Metabolic acidosis is accompanied by a decreased bicarbonate concentration in the serum, as bicarbonate is consumed in the neutralization of increased acidic molecules (hydrogen molecules) in the blood. Serum glucagon and catecholamine concentrations are typically increased, as both are lipogenic, thereby liberating lipids for metabolism to ketones and increasing response to acute physiologic stress. Treatment includes replacement of insulin, volume repletion, correction of electrolyte abnormalities, and treatment of any precipitating conditions.

Incorrect Answers: A, B, C, E, F, G, and H.

Choices A and C are characterized by absent insulin, but also by decreased glucagon. Glucagon is a catabolic hormone that results in lipolysis. Absence of insulin in DKA leads to a perceived energy-deficient state. This perceived starvation state stimulates the production of glucagon in order to liberate lipids that can then be metabolized to ketones.

Choice B is characterized by decreased insulin and increased glucagon, but also by decreased catecholamines. DKA is characterized by a marked increase in serum catecholamines, likely as a response to acute physiologic stress, but also to stimulate the catabolism of lipids.

Choices E, F, G, and H are all characterized by increased serum insulin concentrations, which is incorrect. This young, thin patient is more likely to have type 1 diabetes mellitus, which is characterized by autoimmune destruction of pancreatic islet cells and insulin deficiency. Increased insulin concentration with peripheral insulin resistance is more characteristic of type 2 diabetes mellitus.

Educational Objective: Diabetic ketoacidosis presents with fatigue, polyuria, polydipsia, shortness of breath, and diffuse abdominal pain caused by a deficiency of insulin signaling, commonly in type 1 diabetes mellitus. It results in a high anion gap metabolic acidosis, which is associated with a decreased bicarbonate concentration. Serum findings also include decreased insulin and increased concentrations of glucose, glucagon, and catecholamines.

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✓ 24. A previously healthy 37-year-old woman comes to the physician because of a 2-year history of her hands and fingers turning a bluish color with exposure to cold. The discoloration has been occurring with increasing frequency and now occurs with exposure to air conditioning and cold water. Examination of the hands shows no abnormalities. The brachial and radial pulses are present bilaterally. When the hands are rinsed in cold water, the fingers become bluish then bright red with rewarming. Which of the following is the most appropriate next step in management?

A) β-Adrenergic blocking agent therapy
B) Angiotensin-converting enzyme (ACE) inhibitor therapy
C) Calcium-channel blocking agent therapy
D) Corticosteroid therapy
E) Dorsal sympathectomy

Correct Answer: C.

Vasospasm and the intermittent loss of blood flow to the distal extremities is implicated in causing Raynaud phenomenon, resulting in sequential white, blue, and red discoloration of the affected areas of skin. In severe cases, ischemic injury can result in digital ulcerations. Raynaud phenomenon may be idiopathic or associated with mixed connective tissue disease, systemic lupus erythematosus, or CREST syndrome. In addition to counseling the patient to recognize and avoid triggers (eg, cold temperature, significant emotional stress), initial pharmacologic management should be with calcium-channel blocking (CCB) agent therapy. Long-acting dihydropyridine calcium-channel blockers, such as amlodipine or nifedipine, are recommended because of their efficacy and low risk for adverse effects. Patients should also be advised to avoid vasoconstricting medications and cigarette smoking.

Incorrect Answers: A, B, D, and E.

β-Adrenergic blocking agent therapy (Choice A) should be avoided in treatment of Raynaud phenomenon as the negative inotropic and chronotropic cardiac effects can further limit perfusion of the digits and exacerbate symptoms.

Angiotensin-converting enzyme (ACE) inhibitor therapy (Choice B) has had mixed results in treatment of Raynaud phenomenon. It is generally not recommended because of uncertain benefit. However, angiotensin II receptor blockers have shown some effectiveness and may be considered as a second-line option for patients unable to tolerate CCB agent therapies.

Corticosteroid therapy (Choice D) also has limited effectiveness in treatment of primary Raynaud disease or CREST syndrome, though it may be indicated for other mixed connective tissue diseases associated with the phenomenon. This patient should initially be started on CCB agent therapy.

Dorsal sympathectomy (Choice E) is a minimally invasive management option that is rarely necessary, as most patients with Raynaud phenomenon respond to medical therapy. However, it may be considered for patients who have refractory symptoms.

Educational Objective: Raynaud phenomenon refers to discoloration of the distal extremities associated with an abnormal vascular response to cold temperatures and emotional stress. Calcium-channel blocking agents are first-line therapy as they are effective at reducing peripheral vasospasm and are generally well-tolerated by patients.

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✓ 25. A 60-year-old man comes to the office for a routine examination. Medical history is remarkable for hypertension and alcohol use disorder. Medications are amlodipine and omeprazole. He has smoked one pack of cigarettes daily for 40 years, and he drinks approximately twelve beers daily. Vital signs are within normal limits. Physical examination discloses no abnormalities. Results of serum studies are most likely to show which of the following?

A) Hyperkalemia
B) Hypernatremia
C) Hypomagnesemia
D) Hypophosphatemia

Correct Answer: C.

Hypomagnesemia is a common electrolyte disturbance in the general population, particularly among individuals with alcohol use disorder, occurring in up to one third of this population. Hypomagnesemia is frequently asymptomatic but may present with psychomotor signs and symptoms including depression, lethargy, weakness, tremor, ataxia, or seizures. Severe hypomagnesemia may also present with cardiovascular findings such as supraventricular tachycardia, ventricular arrhythmias, long-QT interval, and torsades de pointes. Hypomagnesemia may induce secondary electrolyte abnormalities, including hypokalemia, hypophosphatemia, and hypocalcemia. Hypomagnesemia occurs in alcohol use disorder as a result of poor dietary intake of magnesium, as well as increased kidney excretion of magnesium. Proton pump inhibitors may cause hypomagnesemia as a result of an unknown mechanism. Other potential causes of hypomagnesemia include medications, such as loop and thiazide diuretics or aminoglycosides, and gastrointestinal malabsorption, which may occur in the setting of chronic diarrhea, inflammatory bowel disease, or celiac disease. Treatment is with oral supplementation of magnesium, although severe hypomagnesemia may require intravenous therapy.

Incorrect Answers: A, B, and D.

Hyperkalemia (Choice A) is incorrect. Hypokalemia is a frequent finding in patients with alcohol use disorder, where it commonly occurs secondary to hypomagnesemia.

Hypernatremia (Choice B) is incorrect. Hyponatremia is frequent in patients with alcohol use disorder, particularly in those who drink large volumes of beer.

Hypophosphatemia (Choice D) may occur secondary to hypomagnesemia in patients with alcohol use disorder, but it is less frequent than hypomagnesemia.

Educational Objective: Hypomagnesemia is frequently asymptomatic, but may present with psychomotor findings, arrhythmias, or with secondary electrolyte disturbances. Particularly common risk factors for hypomagnesemia include alcohol use disorder, use of proton pump inhibitors, diuretics, or aminoglycosides, and gastrointestinal malabsorption. Treatment is with magnesium supplementation.

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26. An 87-year-old woman comes to the physician because of a 3-week history of nausea and general malaise. She has hypertension. One month ago, her blood pressure was 160/95 mm Hg and hydrochlorothiazide therapy was begun. Her only other medication is 81-mg aspirin. She is 157 cm (5 ft 2 in) tall and weighs 50 kg (110 lb); BMI is 20 kg/m^2. Today, her pulse is 78/min; her blood pressure is 155/92 mm Hg in the right upper extremity and 153/90 mm Hg in the left upper extremity. The remainder of the examination shows no abnormalities. Serum studies show:

Na^+	125 mEq/L
K^+	3.2 mEq/L
Cl^-	87 mEq/L
HCO_3^-	25 mEq/L
Ca^{2+}	9.6 mg/dL
Urea nitrogen	14 mg/dL
Glucose	107 mg/dL
Creatinine	0.6 mg/dL

Which of the following is the most appropriate next step in pharmacotherapy?

A) Add lisinopril to the regimen
B) Add losartan to the regimen
C) Add triamterene to the regimen
D) Begin potassium supplementation
E) Discontinue hydrochlorothiazide

Correct Answer: E.

Hyponatremia, or a serum sodium concentration less than 135 mEq/L, may be acute or chronic, with symptoms related to the severity of depletion and the abruptness of onset. Acute decreases in sodium concentration may lead to neurologic symptoms, such as seizure and altered mental status caused by cerebral edema. Chronic hyponatremia, in contrast, leads to less severe symptoms, such as nausea, vomiting, lightheadedness, fatigue, and confusion. One well-known cause of significant hyponatremia is the initiation of diuretics, with other causes including kidney dysfunction, adrenal insufficiency, volume overload, and the syndrome of inappropriate antidiuretic hormone secretion. This patient was recently started on hydrochlorothiazide, shortly after which her symptoms began, making her hyponatremia most likely secondary to thiazide diuretic use. Therefore, the most appropriate next step in pharmacotherapy is discontinuation of hydrochlorothiazide.

Incorrect Answers: A, B, C, and D.

Adding lisinopril to the regimen (Choice A) or adding losartan to the regimen (Choice B) may be reasonable alternatives to hydrochlorothiazide, as this patient will continue to need a medication to treat her hypertension. However, she has symptomatic hyponatremia, and its management should take priority in her care. Thus, discontinuing hydrochlorothiazide is the most appropriate next step.

Adding triamterene to the regimen (Choice C) would be harmful to this patient. While it is a potassium-sparing diuretic that may increase this patient's relatively low potassium concentration, it is known to cause hyponatremia. Since this patient has symptomatic hyponatremia, further decreases in her sodium concentrations could be catastrophic.

Beginning potassium supplementation (Choice D) may be useful for this patient, as she has slightly low concentrations of potassium. This decreased concentration of potassium is most likely secondary to

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Beginning potassium supplementation (Choice D) may be useful for this patient, as she has slightly low concentrations of potassium. This decreased concentration of potassium is most likely secondary to her diuretic use. Thus, discontinuing hydrochlorothiazide, the use of which is likely leading to her symptomatic hyponatremia and asymptomatic hypokalemia, may improve both concentrations.

Educational Objective: Symptoms of hyponatremia are dependent on the severity of depletion and the acuity of onset. Acute onset leads to more severe symptoms, such as seizure and coma, while chronic onset generally has milder symptoms, such as nausea, vomiting, fatigue, and confusion. Diuretics are a common cause of symptomatic hyponatremia, and, thus, patients should have sodium concentrations monitored after initiation. If hyponatremia develops, the diuretic should be discontinued.

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✓ 27. A 15-year-old girl is brought to the office by her mother because of a 3-day history of pain with urination and an increasingly frequent and urgent need to urinate. She has had three episodes of urinary tract infection during the past year. She has no other history of serious illness and currently takes no medications. The patient appears subdued and avoids eye contact. The physician asks the mother to leave the office for the remainder of the interview, and she initially is reluctant. When she leaves the room, the physician asks the patient about her sexual history. The patient appears anxious and asks, "If I answer these questions, will you promise not to tell my mom?" Which of the following is the most appropriate physician response?

A) Ask the patient why she is concerned about confidentiality
B) Empathize with the patient's desire to keep her sexual history private
C) Inform the patient that her information will be shared only if her safety or that of others is at risk
D) Tell the patient that it is worth risking her mother's disapproval to ensure proper treatment of her condition
E) Reassure the patient that the need to break confidentiality about her health is unlikely

Correct Answer: C.

The physician is obligated to protect the patient's confidentiality, even if the patient is an adolescent. Exceptions to adolescent confidentiality are permitted in situations of child abuse, suicidality, homicidal ideation, certain cases related to sexually transmitted infections, mental health care, and, in some states, when a patient consents to an abortion. Each state has varying statutes regarding confidentiality; physicians should be familiar with the statutes in their area. This patient reports symptoms of frequent urinary tract infections, which may indicate consensual sexual activity or sexual abuse. The physician has an obligation to promote the patient's best interests by inquiring about sexual activity or potential abuse while also maintaining honesty about the limits of confidentiality.

Incorrect Answers: A, B, D, and E.

Asking the patient why she is concerned about confidentiality (Choice A) is likely to make the patient defensive and will reduce the likelihood of obtaining truthful information.

Empathizing with the patient's desire to keep her sexual history private (Choice B) is an important component of fostering a therapeutic relationship but does not directly address the patient's question about confidentiality.

Telling the patient that it is worth risking her mother's disapproval to ensure proper treatment of her condition (Choice D) assumes that the patient's hesitance to disclose her sexual history is because of her mother's potential disapproval, which may not be the case.

Reassuring the patient that the need to break confidentiality about her health is unlikely (Choice E) is inappropriate, as the physician does not yet possess adequate information to make this determination. In the setting of sexually transmitted infections or child abuse it may be necessary to break the patient's confidentiality, and the patient must be informed of this possibility.

Educational Objective: Confidentiality must be maintained, even for a minor, unless it applies to child abuse, suicidality, homicidal ideation, some cases of sexually transmitted infections, mental health care, and, in some states, when a patient consents to an abortion. Patients who inquire about confidentiality should be informed about these limitations.

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28. A 37-year-old man with a 2-year history of intermittent right knee pain comes to the office because of a 2-month history of increased knee pain that began after he collided with another person while skiing. The pain has particularly worsened during the past 2 days and has made bearing weight on his right leg difficult. Immediately following the collision, he felt a sharp pain in the middle of his kneecap and sustained several scrapes and cuts on his kneecap, which stopped bleeding within minutes but have continued to slowly ooze a clear discharge thereafter. Medical history otherwise is noncontributory. His only medications are a daily multivitamin and occasional acetaminophen for pain. His temperature is 38°C (100.4°F), pulse is 76/min, and blood pressure is 110/60 mm Hg. Examination shows an erythematous right knee that is warm to touch. The patella is ballotable, and there is moderate joint effusion. Bending the right knee 10 to 15 degrees causes pain; the patient cannot tolerate bending it any further. Which of the following is most likely diagnosis?

A) Anterior cruciate ligament tear
B) Meniscal tear
C) Patellar tendonitis
D) Pyogenic arthritis
E) Synovial chondromatosis

Correct Answer: D.

Pyogenic, or septic, arthritis classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness, such as fever, chills, myalgia, arthralgia, and nausea. Septic arthritis results from a bacterial infection of the synovial joint space, most commonly by *Staphylococcus aureus*. This patient's septic arthritis was likely caused by traumatic arthrotomy that permitted introduction of bacteria and explains the persistent fluid leakage (likely synovial fluid). On physical examination, the affected joint shows swelling, erythema, and pain with passive range of motion. Arthrocentesis is indicated for the evaluation of monoarticular erythema and swelling to evaluate for septic arthritis, which characteristically shows purulent synovial fluid with greater than 50,000 leukocytes/mm^3. Serum studies may also show leukocytosis and increased inflammatory markers, such as C-reactive protein and erythrocyte sedimentation rate. Treatment involves urgent intravenous antibiotics and source control, with patients often requiring irrigation of the joint in the operating room to treat infection and limit further acute and chronic complications.

Incorrect Answers: A, B, C, and E.

Anterior cruciate ligament tear (Choice A) typically presents with acute knee pain and swelling and inability to bear weight immediately after the inciting injury. This patient's knee pain, erythema, and fever is more likely secondary to septic arthritis. Anterior cruciate ligament tears are suspected with anterior knee laxity (determined using the anterior drawer test) and confirmed on MRI.

Meniscal tear (Choice B) can occur with rotation or twisting of the knee while changing direction. Patients typically present with subacute or chronic knee pain and reports of a popping, locking, or catching sensation in the knee. On physical examination, patients may have joint line tenderness, abnormal knee motion, or inability to fully extend the knee. The McMurray test, when positive, supports the diagnosis. MRI is confirmatory.

Patellar tendonitis (Choice C), or inflammation of the patellar tendon, can occur as an overuse injury and presents with pain inferior to the patella during physical activity, climbing stairs, or rising from a chair. It would not likely present with a joint effusion or fever.

Synovial chondromatosis (Choice E) is a rare disease in which the synovium produces nodules of cartilage. This can cause early osteoarthritis and joint pain, but a patient presenting with fever and joint effusion is more likely experiencing septic arthritis.

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noncontributory. His only medications are a daily multivitamin and occasional acetaminophen for pain. His temperature is 38°C (100.4°F), pulse is 76/min, and blood pressure is 110/60 mm Hg. Examination shows an erythematous right knee that is warm to touch. The patella is ballotable, and there is moderate joint effusion. Bending the right knee 10 to 15 degrees causes pain; the patient cannot tolerate bending it any further. Which of the following is most likely diagnosis?

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Educational Objective: Pyogenic, or septic, arthritis classically presents with a painful, erythematous, swollen joint with purulent joint fluid. Arthrocentesis is confirmatory, and treatment involves antibiotics and operative source control.

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29. A 15-year-old girl is brought to the office because of a 2-week history of a facial rash and fatigue. She has a 9-day history of stiffness and swelling of her fingers on awakening in the morning. She has no history of serious illness and takes no medications. She appears tired and has mild chest pain with deep inspiration. Temperature is 38.0°C (100.4°F), pulse is 94/min and regular, respirations are 24/min, and blood pressure is 112/76 mm Hg. A photograph of the patient's face is shown. There are three nontender ulcers over the soft palate. Diffuse 1- to 2-cm lymph nodes are palpated in the anterior and posterior cervical chains. The lungs are clear to auscultation. Heart sounds are normal. Examination of the extremities shows mild erythema, tenderness, and swelling of the proximal interphalangeal and metacarpophalangeal joints, knees, and metatarsophalangeal joints. Urinalysis shows 2+ protein and 1+ blood. Which of the following is most appropriate in determining management for this patient?

A) Cerebral angiography
B) Echocardiography
C) MRI of the brain
D) Renal biopsy
E) X-rays of the knees

https://t.me/USMLENBME2CK

29. A 15-year-old girl is brought to the office because of a 2-week history of a facial rash and fatigue. She has a 9-day history of stiffness and swelling of her fingers on awakening in the morning. She has no history of serious illness and takes no medications. She appears tired and has mild chest pain with deep inspiration. Temperature is 38.0°C (100.4°F), pulse is 94/min and regular, respirations are 24/min, and blood pressure is 112/76 mm Hg. A photograph of the patient's face is shown. There are three nontender ulcers over the soft palate. Diffuse 1- to 2-cm lymph nodes are palpated in the anterior and posterior cervical chains. The lungs are clear to auscultation. Heart sounds are normal. Examination of the extremities shows mild erythema, tenderness, and swelling of the proximal interphalangeal and metacarpophalangeal joints, knees, and metatarsophalangeal joints. Urinalysis shows 2+ protein and 1+ blood. Which of the following is most appropriate in determining management for this patient?

A) Cerebral angiography
B) Echocardiography
C) MRI of the brain
D) Renal biopsy
E) X-rays of the knees

Correct Answer: D.

Systemic lupus erythematosus (SLE) is an autoimmune disorder with a wide range of signs and symptoms, including malar rash, photosensitivity, discoid rash, painless oral ulcers, arthritis, serositis (including pleuritis or pericarditis), kidney impairment, hematologic abnormalities (eg, hemolytic anemia, leukopenia, lymphopenia, thrombocytopenia), an abnormal antinuclear antibody titer, or lupus-specific autoantibodies (anti-DNA, anti-Smith, antiphospholipid antibody). This patient has numerous of these criteria, suggesting a diagnosis of SLE. Lupus nephritis is a complication of SLE and is common in younger women; it presents with hematuria and increasing creatinine in the setting of SLE. Evaluation of lupus nephritis requires renal biopsy in order to accurately determine the type and extent of renal involvement. This information is vital for optimizing the treatment of nephritis. For example, immunosuppressive therapy is warranted for active diffuse or focal proliferative lupus nephritis but not mild mesangial or mesangial proliferative lupus nephritis.

Incorrect Answers: A, B, C, and E.

Cerebral angiography (Choice A) and MRI of the brain (Choice C) are both imaging modalities that may be used to evaluate a patient with neuropsychiatric symptoms caused by SLE. There is no evidence that this patient has neuropsychiatric symptoms, and this imaging is not currently warranted.

Echocardiography (Choice B) is useful in evaluating for pericardial effusions. This patient does have pleuritic chest pain suggestive of potential pleuritis but has no abnormalities on cardiac examination. The more pressing complication of SLE in this case, which requires further diagnostic effort, is lupus nephritis.

X-rays of the knees (Choice E) are a common modality for the evaluation of knee pain. However, this patient has numerous other symptoms suggestive of a diagnosis of SLE. The arthritis of SLE is nonerosive and nondeforming. It is typically treated with oral nonsteroidal anti-inflammatory drugs, antimalarial medications, or glucocorticoids. Because of this, not only will x-rays of the knee likely be normal, but they will not change the management of this patient's arthritis.

Educational Objective: Systemic lupus erythematosus is an autoimmune connective tissue disease, one manifestation of which is lupus nephritis. Hematuria and proteinuria with an increasing creatinine are characteristic of lupus nephritis. Renal biopsy is necessary to accurately determine the type and extent of renal involvement to optimize treatment.

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30. A 67-year-old woman comes to the physician because of a 6-month history of mild pain in her legs with walking and at rest. Her pain is somewhat relieved when she elevates her legs. She has a 3-year history of intermittent swelling of her legs. She has no history of serious illness and takes no medications. She has smoked one-half pack of cigarettes daily for 18 years. She has been able to perform her normal daily activities. Cardiopulmonary examination shows no abnormalities. There is nonpitting edema of the lower extremities. A photograph of the right lower extremity is shown. Which of the following is the most appropriate next step in diagnosis of the lower extremity findings?

A) Echocardiography
B) Lymphangiography
C) Skin biopsy
D) Angiography of the lower extremities
E) No further evaluation is indicated

Correct Answer: E.

Chronic venous insufficiency frequently occurs with age as a result of a combination of venous reflux, incompetent valves, venous hypertension, and decreased muscle function. Risk factors for development include elderly age, prolonged standing, obesity, tobacco use, and a family history of venous disease. Patients may be asymptomatic but when present, symptoms include leg heaviness, pain, and cramping. Physical examination may show varicose, or dilated, veins, nonpitting edema, and lower extremity discoloration, as well as ulceration if the insufficiency is severe. Diagnosis is clinical, although venous duplex ultrasonography can be used if the diagnosis is unclear. Treatment is initially conservative and includes exercise, compression stockings, and leg elevation. Symptomatic patients can undergo venous ablation, sclerotherapy, or other surgical interventions. This patient has chronic leg pain associated with varicose veins on evaluation, making venous insufficiency the most likely cause. No further evaluation is indicated.

Incorrect Answers: A, B, C, and D.

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Correct Answer: E.

Chronic venous insufficiency frequently occurs with age as a result of a combination of venous reflux, incompetent valves, venous hypertension, and decreased muscle function. Risk factors for development include elderly age, prolonged standing, obesity, tobacco use, and a family history of venous disease. Patients may be asymptomatic but when present, symptoms include leg heaviness, pain, and cramping. Physical examination may show varicose, or dilated, veins, nonpitting edema, and lower extremity discoloration, as well as ulceration if the insufficiency is severe. Diagnosis is clinical, although venous duplex ultrasonography can be used if the diagnosis is unclear. Treatment is initially conservative and includes exercise, compression stockings, and leg elevation. Symptomatic patients can undergo venous ablation, sclerotherapy, or other surgical interventions. This patient has chronic leg pain associated with varicose veins on evaluation, making venous insufficiency the most likely cause. No further evaluation is indicated.

Incorrect Answers: A, B, C, and D.

Echocardiography (Choice A) is ultrasonography of the heart used to identify structural abnormalities. This patient has no concerning cardiac symptoms or signs of cardiac dysfunction on physical examination. Echocardiography is not used in the diagnosis of venous insufficiency and is therefore not warranted unless concomitant heart failure is suspected.

Lymphangiography (Choice B) is used to evaluate the lymphatic system. It can be used to determine whether cancer has metastasized to nearby lymph nodes or in the diagnosis of lymphedema. This patient has signs of venous insufficiency rather than lymphedema, making lymphangiography an inappropriate next step in diagnosis.

Skin biopsy (Choice C) is most frequently used in the diagnosis of skin cancer. Most commonly, skin cancer presents with abnormal skin changes such as discoloration and bleeding over a small area with previous sun damage. Skin biopsy can also be used in the diagnosis of vasculitides, although this is less common. This patient has dilated, varicose veins, indicative of venous insufficiency rather than skin cancer or vasculitis.

Angiography of the lower extremities (Choice D) is not necessary for the diagnosis of venous insufficiency. It is more commonly used to evaluate the arterial system, especially in the diagnosis of peripheral artery disease or lower extremity aneurysms. This patient has no signs of arterial disease, making angiography unwarranted.

Educational Objective: Chronic venous insufficiency is common in older patients and presents with lower extremity heaviness, pain, and cramping. Physical examination may show varicose veins, nonpitting edema, and lower extremity discoloration. Risk factors include elderly age, prolonged standing, obesity, tobacco use, and a family history of venous disease. It is a clinical diagnosis, and the treatment is supportive.

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✓ 31. Ten days after undergoing left above-the-knee amputation for severe diabetic soft-tissue infection, a 78-year-old man in the intensive care unit has noisy, labored breathing. His postoperative course has been complicated by sepsis, delirium, and respiratory insufficiency. His temperature is 37.5°C (99.5°F), pulse is 72/min, respirations are 9/min, and blood pressure is 100/50 mm Hg. Pulse oximetry on 3 L of oxygen by nasal cannula shows an oxygen saturation of 92%. He is not oriented to person, place, or time. Breath sounds are coarse and distant bilaterally. The extremities are cool to the touch and mottled. After discussions with the patient's family, and consistent with the patient's wishes, the family has chosen to provide comfort care. The family remains concerned about the patient's current loud breathing and secretions. Which of the following is the most appropriate next step in management?

A) Administration of humidified oxygen
B) Administration of morphine
C) Administration of scopolamine
D) Intubation and mechanical ventilation
E) Placement of a nasogastric tube

Correct Answer: C.

Patients in the process of dying frequently experience difficulty with managing airway secretions, which is distressing both for the patient and for family members. Pharmacologic agents may be useful in reducing the production of airway secretions. Commonly used agents include glycopyrrolate and scopolamine, both of which are anticholinergic agents. Glycopyrrolate may be preferable because of its inability to cross the blood-brain barrier, limiting adverse central nervous system side effects, such as agitation, delirium, and seizures. Scopolamine is available as a patch, which is advantageous for patients with compromised swallowing or excess secretions. Nonpharmacologic methods of managing airway secretions during the dying process include suctioning, positioning the patient on their side, and reducing unnecessary intravenous fluid administration.

Incorrect Answers: A, B, D, and E.

Administration of humidified oxygen (Choice A) is unlikely to be helpful. Excessive secretions are more effectively managed by dehydrating the airway, a strategy that underlies the use of anticholinergic agents.

Administration of morphine (Choice B) is helpful for managing pain in dying patients but will not directly address the family's concern regarding the patient's loud breathing and secretions.

Intubation and mechanical ventilation (Choice D) are invasive measures that are inappropriate given the family's wish to provide comfort care.

Placement of a nasogastric tube (Choice E) is invasive and is unlikely to be helpful. Excessive airway secretions occur during the dying process as a result of the patient's loss of consciousness and reduced drive to cough or clear the throat, rather than gastric reflux.

Educational Objective: Patients in the process of dying frequently experience difficulty with managing airway secretions, which is distressing both for the patient and for family members. Pharmacologic agents may be useful in reducing the production of airway secretions. Commonly used agents include the anticholinergic agents glycopyrrolate and scopolamine.

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32. A previously healthy 4-year-old boy is brought to the emergency department by his mother on a winter evening because of the sudden onset of coughing and mild difficulty breathing. His symptoms began late this afternoon when he was playing with other children at a party. His brother has asthma. The patient's temperature is 37.2°C (99°F), pulse is 92/min, and respirations are 36/min. Physical examination shows intense intermittent coughing and mild intercostal retractions. Wheezes are heard bilaterally but are greater on the right. An x-ray of the chest is shown. Which of the following is the most likely diagnosis?

A) Asthma
B) Congenital lobar emphysema
C) Foreign body aspiration
D) Laryngotracheitis
E) Pneumonia

Correct Answer: C.

This patient is presenting with the acute onset of coughing, dyspnea, tachypnea, and wheezing, making aspiration of a foreign body the most likely diagnosis. Foreign body aspiration is common in children, especially those younger than 2 years old, and may be witnessed or unwitnessed. The most common location of the aspirated object is in the right lung, as the left main bronchus leaves the trachea at sharper angle. These objects often lead to the symptoms seen in this patient, whereas objects lodged in the trachea or larynx often lead to stridor, rapid hypoxia, cyanosis, and even respiratory arrest and death. Physical examination in patients with a foreign body aspiration may disclose stridor and wheezing with decreased air movement. Evaluation often includes a chest x-ray, which will frequently show hyperinflation on the side of the foreign body with a mediastinal shift towards the contralateral side, as seen in this patient. However, most commonly, the aspirated object is not identified on chest x-ray as it is frequently a radiolucent object. Thus, a high index of suspicion is needed to make the diagnosis. Treatment includes removal of the foreign body with bronchoscopy.

Incorrect Answers: A, B, D, and E.

Asthma (Choice A) commonly presents with chronic cough and wheezing on physical examination caused by reactive airways. Acute exacerbations can cause significant respiratory distress leading to hypoxia and hospitalization. However, asthma is generally associated with hyperinflated lungs bilaterally, rather than the unilateral hyperinflation seen in this patient.

Congenital lobar emphysema (Choice B) generally presents by age 6 months with respiratory distress, tachypnea, and cyanosis, as well as wheezing and decreased breath sounds on physical examination. It causes hyperinflation of a lobe of the lung, leading to mediastinal shift and the symptoms seen. While the chest x-ray findings may be similar to those seen in this patient, congenital lobar emphysema would be unlikely to present acutely at age 4 years.

Laryngotracheitis (Choice D), or croup, presents with rhinorrhea, nasal congestion, and fever that progresses to stridor and a barking cough, most commonly as a result of a viral respiratory illness. Symptoms are secondary to narrowing of the subglottic airway, which can be seen on chest x-rays, known as the "steeple sign." This patient does not have a barking cough, stridor, or the "steeple sign" on

C) Foreign body aspiration

D) Laryngotracheitis

E) Pneumonia

Correct Answer: C.

This patient is presenting with the acute onset of coughing, dyspnea, tachypnea, and wheezing, making aspiration of a foreign body the most likely diagnosis. Foreign body aspiration is common in children, especially those younger than 2 years old, and may be witnessed or unwitnessed. The most common location of the aspirated object is in the right lung, as the left main bronchus leaves the trachea at sharper angle. These objects often lead to the symptoms seen in this patient, whereas objects lodged in the trachea or larynx often lead to stridor, rapid hypoxia, cyanosis, and even respiratory arrest and death. Physical examination in patients with a foreign body aspiration may disclose stridor and wheezing with decreased air movement. Evaluation often includes a chest x-ray, which will frequently show hyperinflation on the side of the foreign body with a mediastinal shift towards the contralateral side, as seen in this patient. However, most commonly, the aspirated object is not identified on chest x-ray as it is frequently a radiolucent object. Thus, a high index of suspicion is needed to make the diagnosis. Treatment includes removal of the foreign body with bronchoscopy.

Incorrect Answers: A, B, D, and E.

Asthma (Choice A) commonly presents with chronic cough and wheezing on physical examination caused by reactive airways. Acute exacerbations can cause significant respiratory distress leading to hypoxia and hospitalization. However, asthma is generally associated with hyperinflated lungs bilaterally, rather than the unilateral hyperinflation seen in this patient.

Congenital lobar emphysema (Choice B) generally presents by age 6 months with respiratory distress, tachypnea, and cyanosis, as well as wheezing and decreased breath sounds on physical examination. It causes hyperinflation of a lobe of the lung, leading to mediastinal shift and the symptoms seen. While the chest x-ray findings may be similar to those seen in this patient, congenital lobar emphysema would be unlikely to present acutely at age 4 years.

Laryngotracheitis (Choice D), or croup, presents with rhinorrhea, nasal congestion, and fever that progresses to stridor and a barking cough, most commonly as a result of a viral respiratory illness. Symptoms are secondary to narrowing of the subglottic airway, which can be seen on chest x-rays, known as the “steeple sign.” This patient does not have a barking cough, stridor, or the “steeple sign” on chest x-ray, making this diagnosis unlikely.

Pneumonia (Choice E) commonly presents with fever, dyspnea, and a cough productive of purulent sputum. Chest x-rays will show lobar consolidation or infiltrates depending on the cause of the pneumonia. This patient has no fever or signs of pneumonia on chest x-ray, making this a less likely diagnosis than the aspiration of a foreign body.

Educational Objective: Foreign body aspiration is common in children and presents with the acute onset of coughing, dyspnea, and tachypnea. Physical examination frequently discloses stridor, wheezing, and decreased breath sounds. Chest x-rays will show hyperinflation on the side of the foreign body with a mediastinal shift toward the contralateral side. Treatment includes removal of the foreign body with bronchoscopy.

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33. A 62-year-old man comes to the office with his wife for a follow-up examination 4 weeks after he was hospitalized for management of an acute myocardial infarction that required cardiac catheterization. He has had a 1.4-kg (3-lb) weight gain since discharge. He has not had shortness of breath or chest pain on exertion. He has been sleeping well. His medications are losartan and atorvastatin; he is intermittently adherent to his regimen. He has had irregular attendance at an outpatient cardiac rehabilitation program; he says he sometimes skips sessions because he is tired. His wife says he is irritable and often talks of his father who died of a heart attack at the age of 65 years. The couple has not resumed sexual activity because of the patient's fear of having another heart attack. The patient enjoys seeing his grandchildren but is no longer interested in playing poker with his friends. He is 168 cm (5 ft 6 in) tall and weighs 85 kg (187 lb); BMI is 30 kg/m^2. His pulse is 90/min, respirations are 16/min, and blood pressure is 130/84 mm Hg. Physical examination shows no pedal edema. On mental status examination, he describes his mood as "blah" and has a constricted affect. He reports no suicidal ideation or suicide plan. Which of the following is the most likely diagnosis?

A) Adjustment disorder
B) Generalized anxiety disorder
C) Hypoactive sexual desire disorder
D) Major depressive disorder
E) Post-traumatic stress disorder

Correct Answer: A.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily school, work, or social functioning. Patients may internalize or externalize their distress, resulting in symptoms of depression and/or anxiety symptoms, or conduct disturbances (eg, acting out), respectively. Patients with adjustment disorder do not meet criteria for anxiety, major depressive, or conduct disorders. This patient demonstrates some anxiety and/or depression symptoms (eg, irritability, loss of interest) and conduct disturbances (eg, skipping cardiac rehabilitation sessions) with a prior identifiable stressor and without meeting the criteria for anxiety, major depressive, or conduct disorders. Since adjustment disorder is typically self-limited, appropriate treatment includes brief supportive psychotherapy.

Incorrect Answers: B, C, D, and E.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features excessive worrying about a range of topics with associated functional impairment. This patient displays some symptoms of anxiety about having another heart attack but does not display generalized anxiety over a range of topics.

Hypoactive sexual desire disorder (Choice C) is characterized by deficient or absent sexual thoughts or fantasies, or desire for sexual activity resulting in significant distress, persisting for greater than 6 months, and is not attributable to another medical disorder. This patient does display reduced interest in sexual activity, but this lack of interest is attributable to anxiety about having another heart attack. Further, he does not meet the time criteria for hypoactive sexual desire disorder.

Major depressive disorder (Choice D) includes 2 or more weeks of five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in socializing), guilt or worthlessness, difficulty concentrating, psychomotor retardation, suicidal thoughts, and/or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance). This patient has not met the symptom criteria for major depressive disorder.

Post-traumatic stress disorder (Choice E) refers to greater than 1 month of symptoms of intrusive thoughts and/or memories of trauma, hyperarousal, avoidance of trauma reminders, and/or negative mood or thoughts resulting from a traumatic event, such as a life-threatening motor vehicle collision. This patient has undergone a life-threatening event but is not experiencing intrusive thoughts or hyperarousal.

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attack. The patient enjoys seeing his grandchildren but is no longer interested in playing poker with his friends. He is 168 cm (5 ft 6 in) tall and weighs 85 kg (187 lb); BMI is 30 kg/m^2. His pulse is 90/min, respirations are 16/min, and blood pressure is 130/84 mm Hg. Physical examination shows no pedal edema. On mental status examination, he describes his mood as "blah" and has a constricted affect. He reports no suicidal ideation or suicide plan. Which of the following is the most likely diagnosis?

A) Adjustment disorder
B) Generalized anxiety disorder
C) Hypoactive sexual desire disorder
D) Major depressive disorder
E) Post-traumatic stress disorder

Correct Answer: A.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily school, work, or social functioning. Patients may internalize or externalize their distress, resulting in symptoms of depression and/or anxiety symptoms, or conduct disturbances (eg, acting out), respectively. Patients with adjustment disorder do not meet criteria for anxiety, major depressive, or conduct disorders. This patient demonstrates some anxiety and/or depression symptoms (eg, irritability, loss of interest) and conduct disturbances (eg, skipping cardiac rehabilitation sessions) with a prior identifiable stressor and without meeting the criteria for anxiety, major depressive, or conduct disorders. Since adjustment disorder is typically self-limited, appropriate treatment includes brief supportive psychotherapy.

Incorrect Answers: B, C, D, and E.

Generalized anxiety disorder (Choice B) is an anxiety disorder that features excessive worrying about a range of topics with associated functional impairment. This patient displays some symptoms of anxiety about having another heart attack but does not display generalized anxiety over a range of topics.

Hypoactive sexual desire disorder (Choice C) is characterized by deficient or absent sexual thoughts or fantasies, or desire for sexual activity resulting in significant distress, persisting for greater than 6 months, and is not attributable to another medical disorder. This patient does display reduced interest in sexual activity, but this lack of interest is attributable to anxiety about having another heart attack. Further, he does not meet the time criteria for hypoactive sexual desire disorder.

Major depressive disorder (Choice D) includes 2 or more weeks of five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in socializing), guilt or worthlessness, difficulty concentrating, psychomotor retardation, suicidal thoughts, and/or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance). This patient has not met the symptom criteria for major depressive disorder.

Post-traumatic stress disorder (Choice E) refers to greater than 1 month of symptoms of intrusive thoughts and/or memories of trauma, hyperarousal, avoidance of trauma reminders, and/or negative mood or thoughts resulting from a traumatic event, such as a life-threatening motor vehicle collision. This patient has undergone a life-threatening event but is not experiencing intrusive thoughts or hyperarousal.

Educational Objective: Adjustment disorder refers to the onset of disproportionate distress within 3 months of an identifiable stressor and may be associated with anxiety, major depressive, and/or conduct disturbances, without meeting the full diagnostic criteria for these disorders.

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✓ 34. A 17-year-old primigravid patient at 22 weeks' gestation comes to the physician because of a 12-hour history of fever, nausea, and vomiting. She has abdominal tenderness on the right side when she coughs. Her temperature is 38.3°C (101°F). Pelvic and rectal examinations show right-sided tenderness. Fetal heart tones are normal. Her leukocyte count is 18,000/mm^3 with a shift to the left. Her serum amylase activity is within the reference range. During the next 8 hours, vomiting, fever, and abdominal pain continue. Ultrasonography of the gallbladder shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

A) Barium enema
B) Gallium scan
C) Laparoscopy
D) Peritoneal lavage
E) Amniocentesis

Correct Answer: C.

Appendicitis presents classically with right lower quadrant abdominal pain that is often periumbilical at onset, nausea, anorexia, fever, leukocytosis, and tenderness to palpation in the right lower quadrant on examination. McBurney point, a sensitive location for tenderness on palpation, is located at two-thirds the distance between the umbilicus and the inguinal ligament, because this is the common position of the appendix. In pregnancy, the location of the enlarging uterus may cause the appendix to be displaced superiorly as compared to that of a nongravid patient. This displacement limits the classic history and physical examination, which rely on a right lower quadrant position of the appendix. When displaced cephalad, parietal peritoneal inflammation may no longer occur at the McBurney point, even migrating as cephalad as the right upper quadrant, mimicking diagnoses such as cholecystitis. Diagnosis is facilitated by CT scan (though less ideal in pregnancy due to the risk for teratogenicity to the fetus), MRI, or ultrasonography, which may show appendiceal enlargement, the presence of an appendicolith, appendiceal wall thickening, or periappendiceal fluid or fat stranding. Fetal heart tracings are usually reassuring unless maternal hemodynamics have been compromised, and fetal tachycardia may result from response to maternal fever. Treatment is with urgent laparoscopic appendectomy to prevent complications such as appendiceal rupture, sepsis, preterm labor, and death.

Incorrect Answers: A, B, D, and E.

Barium enema (Choice A) is often used to evaluate abnormalities of the rectum and colon, such as those seen in inflammatory bowel disease or colon cancer. The barium used allows the soft tissues of the gastrointestinal tract to be more clearly defined on x-rays. Generally, x-rays are avoided in pregnant patients given the risk for radiation exposure to the fetus.

Gallium scan (Choice B) can be used to evaluate infection or inflammation throughout the body. It does utilize radiation, which should be avoided in pregnant patients, and is not specific for appendicitis.

Peritoneal lavage (Choice D) is an uncommon technique used to determine if there is a source of intra-abdominal bleeding, especially in trauma patients. If done in pregnant patients, it is often through an open supraumbilical incision. In the setting of infection, such as in this patient, it is nonspecific and unlikely to reveal the diagnosis.

Amniocentesis (Choice E) is most often used in the evaluation of genetic abnormalities of the fetus. It is not warranted at this time, as this patient has no signs of fetal distress or any symptoms of obstetric or gynecologic abnormalities on history or physical examination.

Educational Objective: Appendicitis presents classically with right lower quadrant abdominal pain that is often periumbilical at onset, nausea, anorexia, fever, leukocytosis, and tenderness to palpation in the right lower quadrant on examination. The appendix may be displaced superiorly in pregnancy as a result of the gravid uterus, and appendicitis may mimic other disorders such as cholecystitis. The best option for diagnosis is ultrasonography or MRI, as these limit the radiation exposure to the fetus. Treatment with urgent laparoscopic appendectomy is required.

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35. An 18-year-old man comes to the clinic because of a 3-hour history of right eye pain with mild light sensitivity and blurry vision that have been present since he awakened this morning. He has had no symptoms in his left eye. He reports being struck in the face by a soccer ball last night but having no symptoms at that time. Medical history is remarkable for admission to the hospital 2 years ago for acute chest syndrome secondary to sickle cell disease; he has taken hydroxyurea since that time. He takes no other medications and does not wear corrective lenses. Family history is remarkable for glaucoma in his maternal grandfather. The patient's vital signs are within normal limits. Examination of the right eye shows blood filling the lower 20% of the anterior chamber. Pupils are equal and reactive to light and accommodation bilaterally, and visual fields are intact. Visual acuity is 20/60 in the right eye and 20/20 in the left eye. Intraocular pressure is 27 mm Hg in the right eye and 18 mm Hg in the left eye (N=12–22). Which of the following factors in this patient most strongly increases his risk for complications of his current condition?

A) Age
B) Family history
C) Hydroxyurea use
D) Sickle cell disease

Correct Answer: D.

Hyphema, or the accumulation of blood in the anterior chamber (AC), may occur following blunt ocular trauma, surgery, or spontaneously in the setting of von Willebrand disease, hemophilia, leukemia, or anticoagulant usage. In the setting of trauma, hyphema occurs as a consequence of damage to the AC angle, iris root, or ciliary body, which are richly vascularized. Immediate and subacute complications of hyphema include ocular hypertension, which may lead to glaucomatous optic nerve damage, rebleeding, and corneal blood staining. Corneal blood staining may significantly impair visual acuity and may necessitate corneal transplantation if the central cornea is involved. Chronic complications of hyphema are primarily related to glaucomatous damage to the optic nerve. Hyphema is particularly dangerous in patients with sickle cell disease or trait because of the complications of red blood cell (RBC) sickling. Sickled RBCs in the AC are less likely to be filtered through the trabecular meshwork and are likely to result in ocular hypertension. Ocular hypertension may then induce sickling of RBCs in retinal vasculature, leading to irreversible vision loss through induction of retinal arterial or venous occlusions. Most hyphemas may be managed medically through topical drops to lower ocular pressure. In patients with sickle cell disease or trait, surgical AC washout is indicated if intraocular pressure is not controlled within 24 hours. In contrast, patients without sickle cell disease or trait may tolerate high intraocular pressure for up to 5 days before surgical washout may be considered.

Incorrect Answers: A, B, and C.

Age (Choice A) may play a role in the incidence of hyphema as a result of the increased rate of ocular trauma in young patients. However, age does not affect the rate of complications once hyphema has occurred.

Family history (Choice B) may be indicative of hereditary disorders, such as sickle cell disease or von Willebrand disease. A positive family history of bleeding disorders is not as important for ocular complications as having sickle cell disease.

Hydroxyurea use (Choice C) is useful for the treatment of sickle cell disease by increasing the amount of circulating fetal hemoglobin. Its use does not lead to a significantly increased rate of intraocular bleeding.

Educational Objective: Hyphema, or the accumulation of blood in the anterior chamber, is common following blunt ocular trauma and may lead to significant vision loss as a result of ocular hypertension and glaucoma, corneal blood staining, and angle recession. While most patients may tolerate high intraocular pressure secondary to hyphema for up to 5 days before surgical washout becomes necessary, patients with sickle cell disease or trait are at much higher risk for anterior chamber and retinal vascular red blood cell sickling, which may lead to irreversible vision loss caused by retinal vascular occlusion. Surgical washout should be considered urgently for these patients if intraocular pressure is not controlled within 24 hours.

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36. A previously healthy 16-year-old boy comes to the physician because of constant right-sided scrotal pain for 36 hours. He had sexual intercourse with a new partner 1 week ago. His temperature is 38°C (100.4°F). Abdominal examination shows no abnormalities. There is a scant penile discharge. The right scrotum is swollen and tender, especially posteriorly. The pain is less severe when the scrotum is elevated. Urinalysis and Gram stain of the urethral discharge show leukocytes. Which of the following is the most appropriate next step in management?

A) Semen analysis
B) Transillumination of the scrotum
C) Doppler ultrasonography
D) CT scan
E) Antibiotic therapy
F) Operative procedure

Correct Answer: E.

Epididymitis presents with fever, dysuria, urethral discharge, and tenderness, erythema, and fullness of the scrotum. Men between the second to fourth decade of life are most commonly affected. The most common causative organism is *Chlamydia trachomatis*, followed by *Neisseria gonorrhoeae*. Characteristic clinical features of epididymitis include preservation of the cremasteric reflex (in contrast to its absence in the setting of testicular torsion); a positive Prehn sign, in which testicular pain is alleviated by elevation of the testis; and normal Doppler ultrasonography findings of the testis (though hypervascularity may be noted in cases of epididymo-orchitis). Doppler ultrasonography is most useful when testicular torsion is suspected; however, this patient's presentation is consistent with epididymitis, so the most appropriate next step is to initiate antibiotic therapy to prevent potential spread of sexually transmitted infections and to ease symptoms. Most patients experience resolution of symptoms with antibiotics, including azithromycin and ceftriaxone, and symptomatic relief with nonsteroidal anti-inflammatory drugs, rest, scrotal support, and ice. Follow-up nucleic acid amplification testing is needed to identify causative organisms, such as *C. trachomatis* or *N. gonorrhoeae*, and screening for concomitant sexually transmitted infections, such as syphilis or HIV. Men over age 35 years or those who have unprotected anal insertional intercourse are more commonly infected by *Escherichia coli* as opposed to *C. trachomatis* or *N. gonorrhoeae*.

Incorrect Answers: A, B, C, D, and F.

Semen analysis (Choice A) is an appropriate first step in the evaluation of infertility for a male patient. It does not play a role in the evaluation of epididymitis and acute scrotal pain.

Transillumination of the scrotum (Choice B) is useful for the diagnosis of a scrotal hydrocele, an accumulation of serous fluid within the tunica vaginalis, which typically presents with painless scrotal enlargement.

Doppler ultrasonography (Choice C) is useful for the diagnosis of testicular torsion and may show a lack of testicular perfusion but may not be useful for cases of suspected epididymitis and would not alter the course of treatment. An operative procedure (Choice F), typically with orchiopexy, is necessary for the treatment of testicular torsion in order to prevent testicular infarction. This patient's history of a recent, new sexual partner and penile discharge are suggestive of epididymitis rather than torsion.

CT scan (Choice D) is useful for the diagnosis of various pelvic processes, although is inadequate for the evaluation of acute scrotal pathology.

Educational Objective: Epididymitis presents with fever, dysuria, urethral discharge, and tenderness, erythema, and fullness of the scrotum, most frequently caused by infection with *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. Characteristic clinical features of epididymitis include preservation of the cremasteric reflex, a positive Prehn sign, and normal Doppler ultrasonography findings of the testis. Immediate treatment with antibiotics, including azithromycin and ceftriaxone, is most appropriate in cases of suspected epididymitis.

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37. A 52-year-old woman comes to the physician because of a 1-week history of increasingly severe pain and swelling of her right knee. She now is unable to walk because of the symptoms. Five years ago, she fell and hit the knee on the bathroom floor. She has hypertension treated with lisinopril. Her temperature is 36.9°C (98.4°F), pulse is 84/min, respirations are 20/min, and blood pressure is 132/76 mm Hg. The right knee is erythematous, swollen, and warm. There is diffuse tenderness to light touch; passive and active range of motion is limited by pain. There is no crepitus, but ballottement shows moderate knee effusion. Arthrocentesis is performed, and joint fluid analysis shows a leukocyte count of 50,000/mm^3. A Gram stain is negative; rhomboid-shaped crystals are present. An x-ray of the knee is shown. Which of the following is the most appropriate pharmacotherapy?

A) Febuxostat
B) Ibuprofen
C) Infliximab
D) Methotrexate
E) Penicillamine

Correct Answer: B.

Pseudogout results from calcium pyrophosphate crystalline deposition within the joint space and may manifest acutely following trauma, surgery, or exertion. Crystalline deposition provokes an inflammatory response leading to the classic presentation of joint pain, erythema, effusion, calor, and reduced range of motion. Pseudogout most commonly affects the knee. Arthrocentesis is diagnostic, as it allows for the sampling of synovial fluid, which shows the presence of calcium pyrophosphate crystals and an increased concentration of leukocytes. Additionally, arthrocentesis is necessary to rule out the presence of septic arthritis or hemarthrosis given this patient's presentation of monoarticular erythema and swelling. These competing diagnoses cannot be excluded on clinical features alone. Plain film x-rays may show chondrocalcinosis and degenerative joint changes. First-line medical management includes nonsteroidal anti-inflammatory drugs, such as ibuprofen, and colchicine.

Incorrect Answers: A, C, D, and E.

Febuxostat (Choice A) is used to treat hyperuricemia, such as in gout. Xanthine oxidase inhibitors, such as allopurinol or febuxostat, reduce synthesis of uric acid.

Infliximab (Choice C) is a monoclonal antibody used to treat autoimmune diseases, such as rheumatoid arthritis. Methotrexate (Choice D) is an immunosuppressive medication used in the treatment of various disorders, most notably rheumatoid arthritis, and lymphoma, that competitively inhibits dihydrofolate reductase. Neither are indicated in the treatment of pseudogout.

Penicillamine (Choice E) is used for treatment of rheumatoid arthritis, although it is primarily used to treat hepatolenticular degeneration (Wilson disease).

Educational Objective: Pseudogout results from calcium pyrophosphate crystalline deposition within the joint space and may manifest acutely following trauma, surgery, or exertion. The resulting inflammatory response leads to the classic presentation of joint pain, erythema, effusion, calor, and reduced range of motion. Treatment involves nonsteroidal anti-inflammatory drugs.

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38. A 28-year-old woman comes to the office for a follow-up examination 2 weeks after undergoing a total thyroidectomy because of a thyroid nodule. Immediately after the operation, the patient had the onset of marked hypocalcemia and was admitted to the intensive care unit. During her hospital stay, intravenous calcium and calcitriol were administered. Today, she has had recurrent numbness around her mouth and muscle cramping. Current medications are calcium carbonate three times daily with meals and calcitriol twice daily. Vital signs are within normal limits. Physical examination shows spasm of the ipsilateral facial muscles when tapping 2 cm anterior to the ears on the zygomatic arch bilaterally. The remainder of the examination shows no abnormalities. Laboratory studies are most likely to show an increase in which of the following in this patient?

A) Serum calcium concentration
B) Serum magnesium concentration
C) Serum parathyroid hormone concentration
D) Serum parathyroid hormone-related protein concentration
E) Urinary 24-hour calcium excretion
F) Urine potassium excretion

Correct Answer: E.

Hypocalcemia is a common complication following thyroidectomy as a result of resection of the parathyroid glands. Parathyroid hormone (PTH), along with calcitriol (1,25-hydroxyvitamin-D), regulates calcium homeostasis. PTH is secreted in response to low serum calcium concentrations and acts to raise the concentration by increasing bone resorption, promoting production of calcitriol to increase intestinal absorption of calcium, and increasing calcium resorption in the renal tubules. Patients with hypoparathyroidism will have an increase in urinary 24-hour calcium excretion as a result of the loss of resorption stimulation in the kidneys, requiring daily calcium supplementation. Symptoms of hypocalcemia include perioral paresthesia, carpopedal spasm, laryngospasm, and prolonged QT interval. The Chvostek sign, in which tapping of the facial nerve leads to spasm of the facial muscles, and Trousseau phenomenon, in which an inflated blood pressure cuff occluding the brachial artery causes carpopedal spasm, are two physical examination findings that may indicate hypocalcemia.

Incorrect Answers: A, B, C, D, and F.

Serum calcium concentration (Choice A) is likely to be low in this patient, as she is presenting with symptoms of hypocalcemia at her office visit.

Serum magnesium concentration (Choice B) is likely to be normal in this patient. Hypomagnesemia can be a cause of functional hypoparathyroidism in patients as the gland requires magnesium to produce PTH.

Serum parathyroid hormone concentration (Choice C) is likely to be decreased in this patient and the primary cause of her hypocalcemia.

Serum parathyroid hormone-related protein concentration (Choice D) can be a cause of hypercalcemia associated with malignancy. Patients with hypercalcemia and a low or normal PTH should have their parathyroid hormone-related protein concentration checked as part of the diagnostic workup.

Increases in urine potassium excretion (Choice F) are often caused by diuretic use, mineralocorticoid excess (as in primary hyperaldosteronism), or loss of gastric secretions, which leads to increased bicarbonate exchange in the renal tubules.

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Incorrect Answers: A, B, C, D, and F.

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Increases in urine potassium excretion (Choice F) are often caused by diuretic use, mineralocorticoid excess (as in primary hyperaldosteronism), or loss of gastric secretions, which leads to increased bicarbonate exchange in the renal tubules.

Educational Objective: Parathyroid hormone (PTH) is decreased in hypoparathyroidism, which may be caused by the inadvertent removal of one or more parathyroid glands during thyroidectomy. Symptoms of hypocalcemia, including perioral paresthesia, carpopedal spasm, laryngospasm, prolonged QT interval, Chvostek sign, and Trousseau phenomenon, develop postoperatively. A low concentration of PTH prevents renal reabsorption of calcium, leading to increased urinary calcium excretion.

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39. A previously healthy 27-year-old woman comes to the physician because of a rash over her chest and back for 5 days. She has a 10-day history of pain with urination, urinary frequency, and nocturia two to three times nightly. She took her father's trimethoprim-sulfamethoxazole for 7 days, and her urinary symptoms improved. She currently takes no medications. She does not smoke cigarettes. Her temperature is 37.5°C (99.5°F), pulse is 110/min, respirations are 16/min, and blood pressure is 110/70 mm Hg. Examination of the skin shows an erythematous, maculopapular rash over the trunk. There are no oral lesions. There is no splenomegaly. Laboratory studies show:

Hemoglobin	12.8 g/dL
Leukocyte count	3000/mm^3
Segmented neutrophils	15%
Eosinophils	5%
Basophils	1%
Lymphocytes	54%
Monocytes	25%
Platelet count	200,000/mm^3

Which of the following is the most appropriate next step in management?

A) Repeat examination in 1 week
B) Granulocyte colony–stimulating factor therapy
C) Prednisone therapy
D) Vitamin B_{12} (cyanocobalamin) supplementation
E) Skin biopsy

Correct Answer: A.

Drug-induced neutropenia is one of the most common idiosyncratic drug reactions reported and a large number of medications are associated with this adverse effect. Neutrophils normally account for approximately 40% to 60% of the total white blood cell count on a complete blood count. This patient has an abnormally low count in the setting of recent trimethoprim-sulfamethoxazole use for treatment of a urinary tract infection. She does not have other apparent risk factors or a personal or family history of hematologic disease. The most appropriate next step in management is to repeat examination in 1 week with a repeat complete blood count. Neutropenia in adults is often secondary to drug reactions, infections, malignancy, or direct toxins (including chemotherapy). Antibiotics are commonly implicated in drug-induced neutropenia. Most cases will resolve within days to weeks after discontinuation of the offending agent.

Incorrect Answers: B, C, D, and E.

Granulocyte colony–stimulating factor therapy (Choice B) is not indicated at this time, as drug-induced neutropenia is expected to resolve with discontinuation of the medication. In unstable or hospitalized patients, granulocyte colony–stimulating factor therapy is associated with quicker recovery times and shorter duration of hospitalization.

Prednisone therapy (Choice C) is not necessary at this time. Withdrawal of the drug will provide the most benefit. Topical corticosteroids and antihistamines can be used to treat the skin eruption if bothersome to the patient.

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Monocytes	25%
Platelet count	200,000/mm^3

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Incorrect Answers: B, C, D, and E.

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Prednisone therapy (Choice C) is not necessary at this time. Withdrawal of the drug will provide the most benefit. Topical corticosteroids and antihistamines can be used to treat the skin eruption if bothersome to the patient.

Vitamin B_{12} (cyanocobalamin) supplementation (Choice D) is not likely to benefit the patient at this time. Vitamin B_{12} deficiency presents with megaloblastic anemia and may also manifest neurologic symptoms. Glossitis is sometimes seen. It is not associated with rash formation.

Skin biopsy (Choice E) is a mildly invasive procedure reserved for persistent symptoms with unexplained cause. In a stable patient with a likely explanation for her symptoms, observation and repeat laboratory testing is more appropriate.

Educational Objective: Drug-induced neutropenia is a common idiosyncratic drug reaction that can put patients at risk for life-threatening infections. Withdrawal of the agent implicated in the drug hypersensitivity reaction usually resolves the neutropenia.

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40. A 57-year-old woman who was admitted to the hospital because of pneumonia has had an increase in her serum creatinine concentration from 1 mg/dL to 2.4 mg/dL during the past 3 days. On admission 7 days ago, she had severe shortness of breath and hypotension; she was intubated and mechanically ventilated for 2 days. Six days ago, a CT scan of the chest with contrast showed pneumonia at both lung bases. She also has type 2 diabetes mellitus. Current medications are ceftriaxone, azithromycin, albuterol, insulin, and lisinopril. She is now breathing 3 L/min of oxygen via nasal cannula and has mild shortness of breath. Her blood pressure has been stable for 6 days. Her urine output has been 1 L/24 h during the past 2 days. Her pulse is 70/min, and blood pressure is 150/90 mm Hg. Pulse oximetry on 3 L/min of oxygen via nasal cannula shows an oxygen saturation of 94%. Crackles are heard at both lung bases. Urinalysis shows:

Protein	1+
RBC	10/hpf
WBC	9/hpf
Casts	none

A Wright stain of urine shows eosinophils. Which of the following is the most appropriate next step in management?

A) Add acetylcysteine to the regimen
B) Add nifedipine to the regimen
C) Add prednisone to the regimen
D) Administer a 1-L bolus of 0.9% saline
E) Discontinue ceftriaxone
F) No intervention is indicated

Correct Answer: E.

Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, nonsteroidal anti-inflammatory drugs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infection, or autoimmune disorders such as sarcoidosis and systemic lupus erythematosus. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria, hematuria, and eosinophilia. Patients may have proteinuria, but typically not to the extent of nephrotic syndrome. Eosinophils are often detected on urinalysis, as shown in this case. AIN can be complicated by acute kidney injury and a decline in kidney function. Treatment of AIN includes supportive care and discontinuing the causal medication when there is one, in this case, ceftriaxone.

Incorrect Answers: A, B, C, D, and F.

Add acetylcysteine to the regimen (Choice A) is indicated for the treatment of acetaminophen overdose and, in some cases, acute liver injury. There are no features of this patient's history that suggest current symptoms are induced by acetaminophen or liver injury.

Add nifedipine to the regimen (Choice B) is not the best next step. Nifedipine is a dihydropyridine calcium-channel blocking medication that is a potent arteriolar vasodilator. It does not have a role in management of interstitial nephritis.

Add prednisone to the regimen (Choice C) may be beneficial, as steroids have been shown to improve recovery of kidney function in patients with AIN. However, discontinuing the causal medication is the first step in management.

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Add prednisone to the regimen (Choice C) may be beneficial, as steroids have been shown to improve recovery of kidney function in patients with AIN. However, discontinuing the causal medication is the first step in management.

Administer a 1-L bolus of 0.9% saline (Choice D) can be helpful if decrease in urine output or acute kidney injury is secondary to dehydration. This patient's kidney injury is likely secondary to interstitial nephritis and fluids would play a less significant role than discontinuation of the causal medication.

No intervention is indicated (Choice F) is incorrect, as AIN, if left untreated, can lead to acute kidney injury and a decline in kidney function. Discontinuation of any causal medication and supportive care is necessary.

Educational Objective: Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, nonsteroidal anti-inflammatory drugs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infection, or autoimmune disorders. Treatment of AIN includes supportive care and discontinuing the causal medication.

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41. A 40-year-old man comes to the emergency department because of a 1-day history of nausea and vomiting. He has not had fever, chills, abdominal pain, or diarrhea. He says taking a hot shower alleviates his symptoms. He has no history of serious illness and takes no medications. He says he occasionally uses illicit drugs but refuses to provide any additional information. His temperature is 36.7°C (98°F), pulse is 100/min, respirations are 18/min, and blood pressure is 130/90 mm Hg. Examination shows no other abnormalities. Intoxication from which of the following is the most likely cause of this patient's current condition?

A) Cannabis
B) Cocaine
C) Heroin
D) LSD
E) Methamphetamine
F) PCP (phencyclidine)

Correct Answer: A.

Cannabis is a hallucinogen that causes euphoria, paranoia, hallucinations, increased appetite, conjunctival injection, and cognitive slowing. Chronic cannabis use can lead to a disorder called cannabis hyperemesis syndrome, which is characterized by episodic vomiting associated with prolonged, frequent, and high-dose recreational cannabis use. Patients often find relief with hot-water bathing. It typically resolves after cannabis cessation.

Incorrect Answers: B, C, D, E, and F.

Chronic cocaine abuse (Choice B) may lead to otolaryngologic symptoms such as nasal septal perforation and nosebleeds as well as neuropsychiatric symptoms such as anosmia, cognitive impairment, and psychotic symptoms (eg, delusions, hallucinations). It is also associated with increased risk for acute coronary syndromes, aortic dissection, and placental abruption.

Heroin (Choice C) and other opiate intoxication causes euphoria, altered mental status, sedation (or stupor, if severe), bradycardia, hypotension, depressed respiratory drive, and constricted pupils.

LSD (Choice D) is a potent hallucinogen known to cause auditory and visual hallucinations, depersonalization, flashbacks, and paranoia.

Chronic methamphetamine abuse (Choice E) can lead to methamphetamine-induced psychotic disorder, which features chronic delusions, paranoia, and hallucinations. Chronic methamphetamine use may also lead to cognitive impairment.

PCP (phencyclidine) (Choice F) intoxication is associated with aggression, rotatory nystagmus, and ataxia. Chronic PCP abuse can lead to depression, psychotic symptoms, memory loss, and dysarthria.

Educational Objective: Cannabis hyperemesis syndrome is characterized by episodic vomiting associated with prolonged, frequent, and high-dose recreational cannabis use. Patients often find relief with hot-water bathing.

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42. A 62-year-old woman comes to the physician because of a 4-month history of a painless mass in her left breast; the mass has not changed in size. Ten years ago, she had a total abdominal hysterectomy and bilateral salpingo-oophorectomy. She has hypertension treated with hydrochlorothiazide. Her maternal aunt was diagnosed with breast cancer at the age of 55 years. The patient's vital signs are within normal limits. Examination shows a 2.5-cm hard, immobile mass in the upper outer quadrant of the left breast. Mammography and fine-needle aspiration biopsy specimen show no abnormalities. Which of the following is the most appropriate next step in management?

A) Follow-up examination in 3 months
B) Repeat mammography in 6 months
C) MRI of the left breast
D) Tamoxifen therapy
E) Excisional biopsy

Correct Answer: E.

Breast cancer, the most common nondermatologic malignancy in women, typically consists of two main histologic subtypes, ductal or lobular adenocarcinoma, and can present with a breast mass or axillary lymphadenopathy. Risk factors for development include exogenous estrogen use, family history of breast cancer, genetic mutation (eg, *BRCA1* or *2*), early menarche, late menopause, nulliparity, obesity, and African American ethnicity. In patients over age 30 years with a palpable breast mass or axillary lymphadenopathy, mammography should be the first step in diagnosis. Other radiologic evaluation may include ultrasonography to identify a lesion suitable for biopsy. However, regardless of imaging findings, biopsy should occur if the physical examination is concerning for breast cancer, as it is in this patient. Fine-needle aspiration only has a sensitivity of approximately 74%, as not all samples obtained are adequate for diagnosis. Thus, this patient, with a high-risk lesion on physical examination, should undergo a more sensitive diagnostic evaluation with excisional biopsy, which would remove the whole mass for analysis, and may be curative if disease remains confined to the lesion.

Incorrect Answers: A, B, C, and D.

Follow-up examination in 3 months (Choice A) and repeat mammography in 6 months (Choice B) are inappropriate options. This patient has a highly suspicious lesion on physical examination, and despite having normal mammography and fine-needle aspiration results, should undergo a more thorough evaluation with excisional biopsy. Failure to diagnose this patient's likely breast cancer allows time for the cancer to advance and metastasize, which is associated with a worse prognosis.

MRI of the left breast (Choice C) is not typically used in the diagnosis of breast cancer. More commonly, it is used to evaluate the extent of disease in newly diagnosed breast cancer, or as a screening modality for those at increased risk for developing breast cancer. It is not the most appropriate next step in management for this patient, as it would not provide a tissue diagnosis. It is used more frequently for cancer screening in younger women with dense breast tissue, for whom mammography may be less sensitive.

Tamoxifen therapy (Choice D) is a mixed estrogen receptor agonist and antagonist used in the treatment of breast cancer. This patient should not be treated for breast cancer without a formal diagnosis. Given the results of her previous diagnostic studies, the most appropriate way to confirm the diagnosis is with an excisional biopsy.

Educational Objective: Breast cancer, the most common nondermatologic malignancy in women, may present with a palpable breast mass. In patients over age 30 years, mammography should be the first step in diagnosis. Regardless of imaging findings, biopsy should occur if the physical examination is highly concerning for breast cancer. Fine-needle aspiration is an appropriate initial biopsy technique, but it is associated with a low sensitivity. Those patients with suspicious masses but normal fine-needle aspiration results should therefore undergo excisional biopsy to confirm the diagnosis.

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43. A 2-year-old girl is brought to the office by her mother because of bloody drainage from her right ear that the mother first noticed last night when the patient woke up screaming and holding her right ear. The pain improved after the mother cleaned the ear with a cotton swab and gave the patient ibuprofen, but the mother noted dried, crusted blood on the patient's right ear lobe and pillow when she awoke this morning. The patient also has a 3-day history of cough, congestion, and runny nose. She has no history of serious illness and receives no routine medications. She is at the 25th percentile for height and weight and 50th percentile for BMI. Vital signs are within normal limits. The right tympanic membrane cannot be visualized because of seropurulent fluid in the right external auditory canal. The remainder of the examination, including examination of the left tympanic membrane, discloses no abnormalities. Which of the following is the most likely cause of this patient's ear drainage?

A) Basilar skull fracture
B) Mastoiditis
C) Otitis externa
D) Traumatic injury to the external auditory canal
E) Tympanic membrane perforation

Correct Answer: E.

Acute otitis media is an acute infection of the middle ear and usually spreads to this space via the eustachian (auditory) tubes from the nasopharynx. Acute otitis media classically occurs in children, often from viral or bacterial pathogens, commonly *Streptococcus pneumoniae* or *Haemophilus influenzae*. It presents with ear pain (often with fever) and an erythematous tympanic membrane with retrotympanic pus or a middle ear effusion. Recurrent or persistent episodes of acute otitis media may lead to inflammation of the adjacent mastoid bone, a condition known as mastoiditis. Spontaneous perforation of the tympanic membrane may occur, which typically results in acute conductive hearing loss, bloody or purulent otorrhea, and, often, dramatic alleviation of pain. Tympanic membrane perforation is an indication for treatment with antibiotics, typically with a fluoroquinolone or with amoxicillin and clavulanate. Most tympanic membrane perforations heal spontaneously without surgical intervention.

Incorrect Answers: A, B, C, and D.

Basilar skull fracture (Choice A) occurs following significant cranial trauma and presents with hemotympanum and Battle sign (retroauricular ecchymosis).

Mastoiditis (Choice B) describes bacterial infection of the mastoid air cells. It typically results from untreated or recurrent otitis media and presents with postauricular pain, swelling, and erythema.

Otitis externa (Choice C) is commonly known as “swimmer’s ear,” and presents with mild external ear pain, watery discharge, swelling, and erythema of the external acoustic meatus. Treatment includes topical fluoroquinolone (ciprofloxacin or ofloxacin) ear drops.

Traumatic injury to the external auditory canal (Choice D) may occur following manipulation of the ear canal with a finger or cotton swab. This patient’s history of pain and bloody drainage from the ear preceded manipulation with a cotton swab, suggesting that spontaneous perforation of the tympanic membrane secondary to otitis media is more likely.

Educational Objective: Acute otitis media presents with ear pain (often with fever) and an erythematous tympanic membrane with retrotympanic pus or a middle ear effusion. Spontaneous perforation of the tympanic membrane may occur, which typically results in acute conductive hearing loss, bloody or purulent otorrhea, and, often, dramatic alleviation of pain. Treatment includes antibiotics. Most tympanic membrane perforations heal spontaneously without surgical intervention.

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44. A 20-year-old man comes to the student health services on his college campus because of painful urination and scant urethral discharge for the past week. He says that he has had no fever, chills, or back pain. For the past 6 months, he has engaged in unprotected sexual activity with one partner. He has no history of sexually transmitted diseases or other disorders and takes no medications. He appears well. His temperature is 37°C (98.6°F), pulse is 64/min, respirations are 12/min, and blood pressure is 115/70 mm Hg. Examination shows no costovertebral angle tenderness, penile lesions, or expressible discharge. Urinalysis shows no RBCs, 2–5 WBC/hpf, and no casts; throat cultures are pending. Which of the following is the most appropriate management at this time?

A) Amoxicillin therapy
B) Ceftriaxone and azithromycin therapy
C) Metronidazole therapy
D) Trimethoprim-sulfamethoxazole therapy
E) No treatment until culture and sensitivity test results are known

Correct Answer: B.

Chlamydia trachomatis and *Neisseria gonorrhoeae* can cause sexually transmitted urethritis in men. Risk factors for sexually transmitted infections (STIs) include adolescence, multiple sexual partners, and not using barrier contraception such as condoms. Urethritis typically presents with watery urethral discharge and dysuria. Infection with *C. trachomatis* is frequently asymptomatic. The diagnosis is confirmed with urine nucleic acid amplification. Prompt identification and treatment of STIs can prevent spread to or reinfection of sexual partners and prevent complications such as pelvic inflammatory disease (in women) and sterility. Empiric treatment is appropriate for a patient presenting with symptoms suspicious for an STI. Combination therapy with intramuscular ceftriaxone and oral azithromycin is the most commonly used regimen and provides good coverage against *N. gonorrhoeae* and *C. trachomatis*, respectively.

Incorrect Answers: A, C, D, and E.

Amoxicillin therapy (Choice A) is an alternative therapy for the treatment of an STI with *C. trachomatis* but is less effective than azithromycin.

Metronidazole therapy (Choice C) is effective for the treatment of trichomoniasis and bacterial vaginosis. However, it does not provide coverage against *C. trachomatis* or *N. gonorrhoeae*, which are the most common causes of urethritis in men.

Trimethoprim-sulfamethoxazole therapy (Choice D) is useful for the treatment of nonsexually transmitted urethritis or cystitis. It is not effective against *C. trachomatis* or *N. gonorrhoeae*.

No treatment until culture and sensitivity test results are known (Choice E) is incorrect. In cases of a suspected STI, antibiotic treatment should be initiated as soon as possible following culture. Single-dose, in-office treatment improves compliance and reduces the risk for transmission to partners.

Educational Objective: Urethritis in men is commonly caused by sexually transmitted infection by *Chlamydia trachomatis* and/or *Neisseria gonorrhoeae*. Empiric treatment is appropriate for a patient presenting with symptoms highly suspicious for a sexually transmitted infection. Combination therapy with intramuscular ceftriaxone and oral azithromycin is a commonly used regimen.

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45. A 62-year-old woman comes to the physician for PPD skin testing prior to beginning volunteer work in a school. She has hypertension treated with hydrochlorothiazide and osteoarthritis treated with acetaminophen. She was born in the USA. She has had no sick contacts. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Physical examination shows no abnormalities. A PPD skin test produces 6 mm of induration at 48 hours. Results of liver function tests are within the reference ranges. A chest x-ray shows no abnormalities. Which of the following is the most appropriate next step in management?

A) Provide clearance to begin volunteer work
B) Repeat PPD skin testing to assess for booster phenomenon
C) Obtain culture of three induced sputum samples for acid-fast bacilli
D) Begin isoniazid and pyridoxine therapy
E) Begin isoniazid, rifampin, pyrazinamide, and ethambutol therapy
F) Begin isoniazid therapy only

Correct Answer: A.

Mycobacterium tuberculosis is a slow-growing mycobacterial organism transmitted via respiratory secretions. It presents with primary, latent, and reactivation patterns. In primary disease, patients present with subacute fevers, weight loss, night sweats, cough, and malaise. Latent tuberculosis can occur as the organism proliferates within macrophages and is maintained within caseating granulomas. PPD skin testing stimulates a T-cell driven type IV (delayed) hypersensitivity reaction against subdermally injected tuberculin antigen. A common cause of false positive PPD testing includes prior vaccination with BCG vaccine. Per Centers for Disease Control and Prevention guidelines, induration exceeding 15 mm is considered a positive result for a PPD skin test in patients with no risk factors for tuberculosis. Induration exceeding 10 mm is considered a positive test result for high-risk patients, such as recent immigrants from countries where tuberculosis is common, intravenous drug users, residents of and workers in high-risk congregate settings (such as prisons, homeless shelters, or nursing care facilities), or those with particular medical conditions, such as silicosis, diabetes mellitus, or chronic renal failure, among others. Induration greater than 5 mm is considered positive in patients with HIV, with recent contact with a tuberculosis-positive patient, or with organ transplantation or immunosuppression. This patient's test result is negative for her demographic, and she should be provided clearance to begin volunteer work.

Incorrect Answers: B, C, D, E, and F.

Repeat PPD skin testing to assess for booster phenomenon (Choice B) is recommended for initial testing in patients who will be periodically retested, such as healthcare workers. In patients with a history of remote tuberculosis exposure with faded immune memory, an initial PPD test may provide a false negative result. However, exposure to tuberculin will boost immune memory and stimulate a positive result on the second PPD test. Two-step PPD testing is not necessary for routine PPD testing of non-high-risk patients.

Obtaining cultures of three induced sputum samples for acid-fast bacilli (Choice C) is useful for the diagnosis of tuberculosis in a patient with suspected primary or latent tuberculosis. This patient's PPD result is negative and should not prompt further diagnostic evaluation.

Beginning isoniazid and pyridoxine therapy (Choice D) or beginning isoniazid therapy only (Choice F) would be appropriate during a 9-month course for the treatment of latent tuberculosis. Patients at risk for pyridoxine deficiency or peripheral neuropathy may benefit from therapy with isoniazid plus pyridoxine to reduce the risk for peripheral neuropathy related to vitamin B_6 (pyridoxine) deficiency.

Beginning isoniazid, rifampin, pyrazinamide, and ethambutol therapy (Choice E) is appropriate for the treatment of active primary or recurrent tuberculosis.

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Correct Answer: A.

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Incorrect Answers: B, C, D, E, and F.

Repeat PPD skin testing to assess for booster phenomenon (Choice B) is recommended for initial testing in patients who will be periodically retested, such as healthcare workers. In patients with a history of remote tuberculosis exposure with faded immune memory, an initial PPD test may provide a false negative result. However, exposure to tuberculin will boost immune memory and stimulate a positive result on the second PPD test. Two-step PPD testing is not necessary for routine PPD testing of non-high-risk patients.

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Beginning isoniazid, rifampin, pyrazinamide, and ethambutol therapy (Choice E) is appropriate for the treatment of active primary or recurrent tuberculosis.

Educational Objective: PPD skin testing stimulates a T-cell driven type IV (delayed) hypersensitivity reaction against subdermal tuberculin antigen and is useful for the detection of latent tuberculosis infection. Induration exceeding 15 mm is considered a positive result for a PPD skin test in patients with no risk factors for tuberculosis. Induration exceeding 10 mm is considered a positive result for high-risk patients. Induration exceeding 5 mm is considered positive for immunocompromised patients.

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46. A 42-year-old man comes to the emergency department because of a 2-day history of nausea, vomiting, and malaise. He has bipolar disorder, herpes simplex virus 2, and chronic shoulder pain secondary to a torn rotator cuff injury sustained 7 years ago. His medications are valproic acid, sertraline, acyclovir, hydrocodone-acetaminophen, and docusate. He does not drink alcohol or use illicit drugs. His temperature is 37.2°C (99°F), pulse is 102/min, and blood pressure is 122/84 mm Hg. Physical examination shows dry mucous membranes. Abdominal examination shows tenderness to palpation. On mental status examination, he has a dysphoric mood and congruent affect. Laboratory studies show:

Leukocyte count	8000/mm^3
Serum	
AST	38 U/L
ALT	52 U/L
Amylase	465 U/L

Which of the following medications is the most likely cause of this patient's current symptoms?

A) Acyclovir
B) Docusate
C) Hydrocodone-acetaminophen
D) Sertraline
E) Valproic acid

Correct Answer: E.

Valproic acid is an antiepileptic drug and mood stabilizer that is used to treat patients with schizoaffective or bipolar disorder. Drug-induced acute pancreatitis is a rare adverse effect of valproic acid that is idiosyncratic, or not related to drug dosage or duration of treatment. The mechanism of this adverse reaction is unknown but possibly related to reactive oxygen species-induced endothelial damage within the pancreas. For patients in whom valproic acid-induced pancreatitis is suspected, other possible causes of acute pancreatitis should be excluded. In the majority of cases, pancreatitis is self-limited and resolves with discontinuation of the drug. Other idiosyncratic valproic acid reactions include hepatotoxicity, bone marrow toxicity, and alopecia.

Incorrect Answers: A, B, C, and D.

Acyclovir (Choice A) is not associated with drug-induced pancreatitis. Common adverse effects of acyclovir include nausea, vomiting, and diarrhea. Nephrotoxicity may occur with high-dose intravenous administration.

Docusate (Choice B) is a stool softener. It is generally well-tolerated and is not associated with drug-induced pancreatitis. Common adverse effects include diarrhea and gastrointestinal discomfort.

Hydrocodone-acetaminophen (Choice C) is not commonly associated with drug-induced pancreatitis. Common adverse effects include hepatotoxicity, reduced gastrointestinal motility, respiratory depression, and sedation.

Sertraline (Choice D) is a selective serotonin reuptake inhibitor that is not frequently associated with drug-induced pancreatitis. It is generally well-tolerated, though in high doses or in the setting of drug interactions it may cause serotonin syndrome

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Serum	
AST	38 U/L
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Amylase	465 U/L

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Sertraline (Choice D) is a selective serotonin reuptake inhibitor that is not frequently associated with drug-induced pancreatitis. It is generally well-tolerated, though in high doses or in the setting of drug interactions it may cause serotonin syndrome.

Educational Objective: Drug-induced acute pancreatitis is a rare adverse effect of valproic acid that is idiosyncratic, or not related to drug dosage or duration of treatment. The mechanism is unknown. In the majority of cases, the pancreatitis is self-limited and resolves with discontinuation of the drug.

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47. A 72-year-old woman comes to the office with her son for a follow-up examination. She was diagnosed with Parkinson disease 8 years ago. She says her health has declined substantially during the past 6 months. She feels weaker and has had increasing difficulty walking. She has stopped attending weekly luncheons with her friends. The patient's son says his mother sleeps poorly at night and naps frequently during the day. He has to encourage her to eat and take her medications. The patient's medications are carbidopa-levodopa and donepezil. She appears sad and is tearful as she discusses her difficulties. Examination shows a mild resting tremor of the hands and mild bradykinesia. When asked to stand and walk from a seated position, she moves slowly and pushes on the arms of the chair with her hands; she takes steps with no hesitation but walks slowly. Which of the following is the most appropriate next step in pharmacotherapy?

A) Add mirtazapine to the medication regimen
B) Add rasagiline to the medication regimen
C) Add zolpidem to the medication regimen
D) Increase the dosage of carbidopa-levodopa
E) Increase the dosage of donepezil

Correct Answer: A.

Parkinson disease is a progressive neurodegenerative disorder caused by degradation of dopaminergic neurons in the substantia nigra. Symptoms are associated with an imbalance of dopamine and acetylcholine, resulting in the characteristic findings of bradykinesia, resting tremor, muscle rigidity, and postural instability. Psychiatric disturbances, sleep disorders, and dementia are common complications in addition to prominent motor symptoms. Depression is common in elderly patients with Parkinson disease and other types of dementia, such as Alzheimer dementia. It presents with 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in socializing), guilt or worthlessness, difficulty concentrating, suicidal thoughts, and/or neurovegetative symptoms (eg, decreased energy, sleep disturbance, appetite disturbance). In addition, patients with Parkinson disease may present with worsening motor function while experiencing depression and are at particularly increased risk for suicide. Treatment of depression consists of pharmacotherapy with a selective serotonin reuptake inhibitor (SSRI) or atypical antidepressant, such as mirtazapine. Mirtazapine may be particularly useful in patients with insomnia because of its sedating side effects and in those with appetite loss. Cognitive behavioral therapy is also useful for managing depression.

Incorrect answers: B, C, D, and E.

Adding rasagiline to the medication regimen (Choice B) is incorrect. Rasagiline is a monoamine oxidase inhibitor that is useful for treating symptoms of early Parkinson disease. It is less useful for the treatment of depression associated with Parkinson disease and should be used with caution if combined with particular antidepressants, such as SSRIs, because of the risk for serotonin syndrome.

Adding zolpidem to the medication regimen (Choice C) is incorrect. Zolpidem is a nonbenzodiazepine sedative-hypnotic medication. It is utilized to treat insomnia but is not helpful in the treatment of depression. It is also relatively contraindicated in elderly populations and in those with dementia.

Increasing the dosage of carbidopa-levodopa (Choice D) is incorrect. Carbidopa-levodopa nonselectively increases dopamine concentrations in the basal ganglia and limbic system, leading to improvement of Parkinson disease symptoms. While raising the dose of carbidopa-levodopa is useful for treating residual symptoms of Parkinson disease, it does not treat depression, and higher doses are associated with an increased risk for psychotic symptoms.

Increasing the dosage of donepezil (Choice E) is incorrect. Donepezil is an anticholinesterase inhibitor that indirectly increases the concentration of the neurotransmitter acetylcholine. It is useful for treating Alzheimer dementia, but also improves cognition in Parkinson disease dementia. It is not useful for treating depression.

Educational Objective: Parkinson disease is associated with depression, which may lead to worsening of motor function and increased risk for suicide. Treatment is with selective serotonin reuptake

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discusses her difficulties. Examination shows a mild resting tremor of the hands and mild bradykinesia. When asked to stand and walk from a seated position, she moves slowly and pushes on the arms of the chair with her hands; she takes steps with no hesitation but walks slowly. Which of the following is the most appropriate next step in pharmacotherapy?

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Educational Objective: Parkinson disease is associated with depression, which may lead to worsening of motor function and increased risk for suicide. Treatment is with selective serotonin reuptake inhibitors or atypical antidepressants, as well as cognitive behavioral therapy. The atypical antidepressant mirtazapine is particularly useful for patients with concomitant depression and insomnia.

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48. A 32-year-old primigravid woman at 10 weeks' gestation comes to the physician for her first prenatal visit. She conceived after in vitro fertilization. Three years ago, a bicornuate uterus was noted on diagnostic laparoscopy for primary infertility. She is otherwise healthy, and her only medication is a prenatal vitamin. She is 163 cm (5 ft 4 in) tall. She weighed 50 kg (110 lb) prior to her pregnancy; BMI was 19 kg/m^2. She has had a 1-kg (2-lb) weight gain during her pregnancy. Her blood pressure is 110/70 mm Hg. Examination shows a uterus consistent in size with a 10-week gestation. This patient is at greatest risk for which of the following pregnancy complications?

A) Abruptio placentae
B) Placenta accreta
C) Placenta previa
D) Preterm delivery
E) Uterine rupture

Correct Answer: D.

Infertility can have a multitude of causes, including hormonal disorders, inflammatory diseases, structural abnormalities, autoimmune diseases, clotting disorders, and lifestyle factors. Infertility can be primary in patients who have never conceived, or secondary in patients who had previous conceptions. Regardless, it is defined as the inability of a couple to conceive after 12 months of regular intercourse, or after 6 months of intercourse in women over age 35 years. The evaluation of infertility often includes a history and physical examination, as well as laboratory evaluation, imaging studies, and, potentially, laparoscopy. Common causes of infertility include ovulatory dysfunction and endometriosis. Congenital structural uterine abnormalities, as seen in this patient, can lead to infertility. A bicornuate uterus is caused by failure of the paramesonephric (müllerian) ducts to fully fuse, resulting in two completely or partially separate uterine cavities. Because of this, there is a diminished area for egg implantation, as well as placental and fetal development, which predisposes the patient to infertility and recurrent pregnancy loss. A bicornuate uterus also increases the risk for preterm delivery, fetal growth restriction, and malpresentation. Therefore, this patient is at the highest risk for preterm delivery given her anatomic uterine variant.

Incorrect Answers: A, B, C, and E.

Abruptio placentae (Choice A) is the premature separation of the placenta from the uterus. It commonly presents with vaginal bleeding, severe uterine pain, and tetanic contractions, typically in the third trimester. Risk factors include cocaine use, trauma, smoking, and preeclampsia, but not generally congenital uterine anomalies.

Placenta accreta (Choice B) refers to the abnormal attachment of the placenta to the myometrium/perimetrium and even through to the serosa and, potentially, adjacent organs (termed 'percreta'), rather than to just the decidualized endometrium. It is commonly diagnosed on prenatal ultrasonography but can present with postpartum hemorrhage caused by retained placental tissue. A bicornuate uterus is not a risk factor for placenta accreta.

Placenta previa (Choice C) is an abnormal positioning of placental tissue such that the placenta partially or entirely overlies the internal cervical os. It can spontaneously resolve, but if it persists into the third trimester, it may result in painless vaginal bleeding. Severe bleeding from placenta previa may lead to hemorrhagic shock, and treatment involves delivery with cesarean section. This patient is not at increased risk for placenta previa.

Uterine rupture (Choice E) is a dangerous obstetric complication where the uterine wall tears, presenting with acute pain and both maternal and fetal hemodynamic instability. The sudden loss of fetal station is a suggestive finding. Risk factors include prior cesarean delivery or uterine surgery, whereas a bicornuate uterus does not increase the risk.

Educational Objective: Congenital uterine anomalies can be the cause of primary infertility as well as recurrent pregnancy loss. For example, a bicornuate uterus with two separate endometrial cavities has

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patient is at greatest risk for which of the following pregnancy complications?

A) Abruptio placentae
B) Placenta accreta
C) Placenta previa
D) Preterm delivery
E) Uterine rupture

Correct Answer: D.

Infertility can have a multitude of causes, including hormonal disorders, inflammatory diseases, structural abnormalities, autoimmune diseases, clotting disorders, and lifestyle factors. Infertility can be primary in patients who have never conceived, or secondary in patients who had previous conceptions. Regardless, it is defined as the inability of a couple to conceive after 12 months of regular intercourse, or after 6 months of intercourse in women over age 35 years. The evaluation of infertility often includes a history and physical examination, as well as laboratory evaluation, imaging studies, and, potentially, laparoscopy. Common causes of infertility include ovulatory dysfunction and endometriosis. Congenital structural uterine abnormalities, as seen in this patient, can lead to infertility. A bicornuate uterus is caused by failure of the paramesonephric (müllerian) ducts to fully fuse, resulting in two completely or partially separate uterine cavities. Because of this, there is a diminished area for egg implantation, as well as placental and fetal development, which predisposes the patient to infertility and recurrent pregnancy loss. A bicornuate uterus also increases the risk for preterm delivery, fetal growth restriction, and malpresentation. Therefore, this patient is at the highest risk for preterm delivery given her anatomic uterine variant.

Incorrect Answers: A, B, C, and E.

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Uterine rupture (Choice E) is a dangerous obstetric complication where the uterine wall tears, presenting with acute pain and both maternal and fetal hemodynamic instability. The sudden loss of fetal station is a suggestive finding. Risk factors include prior cesarean delivery or uterine surgery, whereas a bicornuate uterus does not increase the risk.

Educational Objective: Congenital uterine anomalies can be the cause of primary infertility as well as recurrent pregnancy loss. For example, a bicornuate uterus with two separate endometrial cavities has less room for appropriate egg implantation, placental development, and fetal growth. Patients with this abnormality are also at increased risk for preterm delivery, fetal growth restriction, and malpresentation.

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49. A 22-year-old man with alcohol use disorder comes to the physician because of a 3-week history of weakness in his right hand. His symptom began after drinking a bottle of whiskey. He has no history of serious illness and takes no medications. He drinks six cans of beer daily. On examination of the right upper extremity, muscle strength is 2/5 in the supinator, wrist extensors, and finger extensors; strength is 5/5 in all other muscles. Sensation to pinprick is decreased over the dorsum of the right hand from the wrist to the base of the thumb and index finger. Which of the following is the most appropriate next step in diagnosis?

A) Determination of erythrocyte sedimentation rate
B) Electromyography and nerve conduction studies
C) MRI of the brachial plexus
D) MRI of the brain
E) MRI of the cervical spine

Correct Answer: B.

The radial nerve is a nerve of the brachial plexus and is comprised of afferents and efferents from the C5-T1 nerve roots. It courses through the axilla, down the posterior shaft of the humerus within the spiral groove, and then along the posterolateral aspect of the forearm. The radial nerve supplies motor fibers to the triceps brachii and the extensor muscles within the posterior compartment of the forearm, and sensory fibers to the dorsum of the forearm, wrist, and hand. It does not innervate the intrinsic muscles of the hand. It is prone to injury with midshaft humerus fractures, as it runs near the humeral diaphysis within the spiral groove. Injury to the nerve presents with loss of function of structures distal to the injury. In the case of this patient, the weakness of the wrist and finger extensors suggests injury within the axilla or arm. In cases of acute intoxication, prolonged compression of the nerve against a hard surface is a common cause during periods of unconsciousness. Electromyography and nerve conduction studies are most appropriate for determining a diagnosis of radial nerve palsy.

Incorrect Answers: A, C, D, and E.

Determination of erythrocyte sedimentation rate (Choice A) is a nonspecific marker of inflammation, which may be increased in disorders such as myositis, dermatomyositis, and polymyositis.

MRI of the brachial plexus (Choice C) can be helpful in diagnosing brachial plexus injury. Brachial plexus injury, depending on the location within the plexus, would involve motor and sensory loss of multiple nerves. A mononeuropathy, such as in this patient, makes a brachial plexus injury less likely.

MRI of the brain (Choice D) would be helpful in diagnosing acute ischemic stroke, whereas this patient is presenting with a peripheral nerve palsy.

MRI of the cervical spine (Choice E) would be helpful in diagnosing central cord syndrome, which presents with decreased sensation and strength of the upper extremities. However, this patient is presenting with specific peripheral, not central, radial nerve palsy.

Educational Objective: Radial nerve injuries typically present with the inability to extend the elbow, forearm, wrist, or fingers, along with the loss of sensation to the posterior arm and dorsal hand. The diagnosis of radial nerve palsy is determined with electromyography and nerve conductions studies.

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50. One day after delivery of a healthy newborn at term, a 22-year-old woman, gravida 2, para 2, has fever. Pregnancy and delivery were uncomplicated. Her temperature is 39.4°C (103°F), pulse is 110/min, respirations are 22/min, and blood pressure is 125/70 mm Hg. Examination shows normal lochia rubra. The uterus is tender, and the fundus extends to the umbilicus. Her leukocyte count is 17,000/mm^3 with a shift to the left. While awaiting results of additional laboratory studies, which of the following is the most likely causal organism?

A) *Candida albicans*
B) *Escherichia coli*
C) *Mycoplasma pneumoniae*
D) *Staphylococcus aureus*
E) *Staphylococcus epidermidis*

Correct Answer: B.

Endometritis is an acute infection of the uterine endometrium that commonly occurs after delivery. Patients typically present with fever, tenderness of the uterine fundus, and mucopurulent vaginal discharge. Laboratory studies commonly show leukocytosis. Endometritis is caused by ascending bacteria from the vagina, and risk factors for development include cesarean delivery, prolonged membrane rupture, advanced maternal age, and multiple cervical examinations. Endometritis is commonly polymicrobial, but isolated pathogens often include *Escherichia coli*, *Enterobacter*, *Enterococcus*, *Bacteroides*, and *Clostridium*. When severe, it can cause bacteremia and sepsis. Treatment with intravenous antibiotics is required.

Incorrect Answers: A, C, D, and E.

Candida albicans (Choice A) can cause vulvovaginitis, which presents with vaginal itching and thick, white discharge. It commonly occurs as a result of the disruption of vaginal flora in the setting of antibiotic use. It would not explain this patient's fever or uterine tenderness.

Mycoplasma pneumoniae (Choice C) is a cause of upper respiratory infection and atypical pneumonia. These may present with fever, cough, rhinorrhea, and dyspnea. It would not be expected to cause a postpartum fever associated with uterine tenderness.

Staphylococcus aureus (Choice D) may be isolated in endometritis, but it is a less common pathogen than *E. coli*. When present, it can cause toxic shock syndrome as a result of the release of exotoxin with severe fever, hypotension, and skin changes, such as erythema or desquamation.

Staphylococcus epidermidis (Choice E) is a skin flora that is commonly seen in line- or hardware-associated infections, surgical site infections, and endocarditis. It would not be an expected pathogen in endometritis.

Educational Objective: Endometritis is an acute infection of the uterine endometrium that commonly occurs after delivery. Patients typically present with fever, tenderness of the uterine fundus, mucopurulent vaginal discharge, and leukocytosis. Endometritis is commonly polymicrobial, but isolated pathogens often include *Escherichia coli*, *Enterobacter*, *Enterococcus*, *Bacteroides*, and *Clostridium*.

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